SCIENTIFIC AMERICAN

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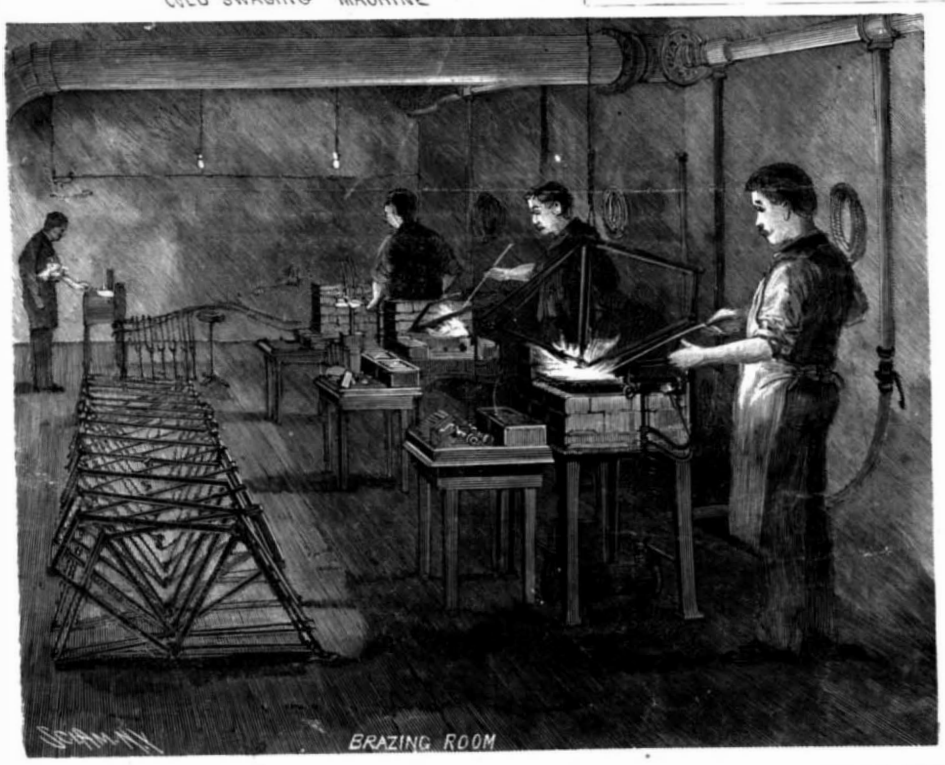
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXIV.—No. 1. ESTABLISHED 1845. | NEW YORK, JANUARY 4, 1896 | $3.00 A YEAR. WEEKLY.

COLD SWAGING MACHINE

CENTREING WHEEL BEARINGS



BRAZING ROOM

MILLING MACHINES

ASSEMBLING THE BICYCLES

HOW A BICYCLE IS MANUFACT

BLACK MA

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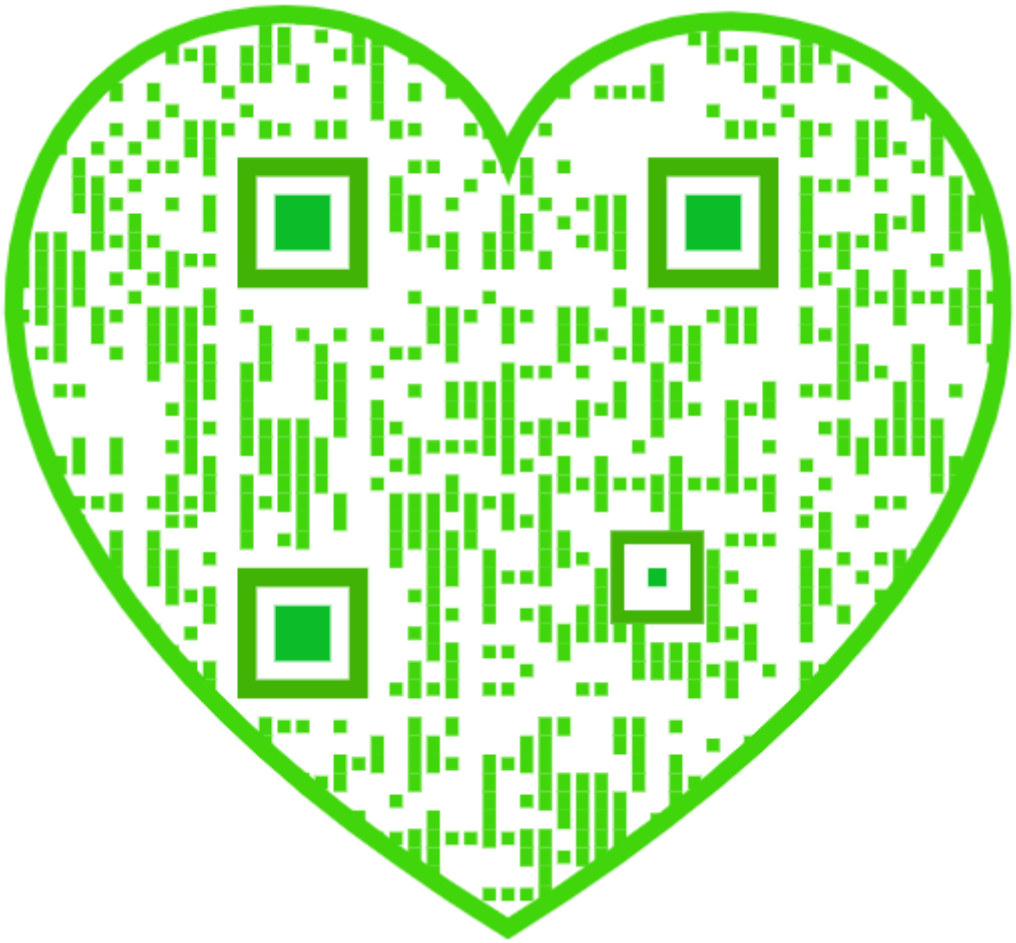

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....$3 00
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One copy, one year, to any foreign country belonging to Postal Union 4 00
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MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

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NEW YORK, SATURDAY, JANUARY 4, 1896.

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Remove Oil Spots on Paper.

THE MODERN BICYCLE.

The enormous amount of capital represented by the bicycle industry has been noticed in these columns before. Originally the velocipede found no application except as a toy. In the early days adults as well as children took up the bicycle as recreation pure and simple, its propulsion over the ordinary roads being so laborious as to make it available only under very exceptional circumstances.

In the old velocipede the inelasticity of the frame made it hard to drive, and it was only rendered endurable from the point of comfort by having a saddle mounted on springs. Slumbering among the patent records meanwhile was an invention which was destined to transform the primitive bone shaker into a conveyance of ease and comfort and to minimize the inequalities of the road. The application of this invention, now known as the pneumatic tire, the adoption of a slight change in proportions, and the use of multiplying gearing for the increase of speed, were all that were wanting to make the modern bicycle.

The development of the cycle, notwithstanding, was slow. First came the old-fashioned high-wheel bicycle, the possible diameter of whose wheel was fixed by the size of the person riding. By special leverage arrangement the size of the wheel was increased in some cases up to 7 or 8 feet in diameter. After various efforts at front-driven low or safety wheels came the modern safety, driven by the rear wheel. Solid India rubber tires were still in use, and various attempts were made, and with more or less success, to introduce springs into the frame, so as to moderate the jar incident to the inequalities of the road, until the pneumatic tire was introduced. The modern bicycle is the result.

Two exhibitions of bicycles and accessories are to follow each other in rapid succession during the next two weeks—one in Chicago and one in New York. In February a third exhibition is to be held in Denver. The SCIENTIFIC AMERICAN, realizing that comparatively little is known by the general public of the methods of manufacture adopted in the modern bicycle factory, and that many points in modern bicycle construction are but little understood, has determined to present its readers with the methods of construction and machinery used in the production of a first-class wheel.

The exhibitions alluded to above will show the present development of the machine, which, in conjunction with the electric railroad and the automobile carriage, is doing its part to make the horse-drawn vehicle in great part a thing of the past. In them will be represented the latest modifications of this most interesting mechanical achievement, which enables a man to increase his speed from four miles an hour to twelve or fifteen—a machine in which the study of joints has received great attention and where the art of connecting steel members of a frame has been brought to the highest perfection—in which the subject of bearings has been worked up to consummate excellence so that a ball bearing wheel will travel thousands of miles without the balls or cones showing any appreciable wear.

Merely as an example of the truss, a bicycle represents a veritable achievement, for its frame may be considered as a truss spanning a distance between the front and rear wheel axles, and in the case of quadruplet and quintuplex wheels the truss may have to carry nearly a thousand pounds.

The most healthful sign of what cycling really means is its employment by business men, by the farmer and by government officials. The cycle is being used by the police of different cities, by the postmen and by street inspectors. It is being used with the greatest success by the signal service department of the army, and cycle drills in the regular army will soon be among the tactical evolutions in this country, as they have long been abroad.

As an example of the practical use of the wheel in the regular army, Lieut. Hugh D. Wise's ride from Sackett's Harbor, N. Y., to Governor's Island, in the harbor of New York City, may be cited. Mounted on an 18½ pound racing wheel, and loaded with a pack representing the heavy marching order equipment of the regular army, the distance of about 400 miles was made in 84 hours. The heat of the weather, the sandy roads, and the mountains traversed made the ride an unusually trying one, but six hours' sleep being obtained during the entire trip. Considering the extreme lightness of the wheel, it stood the trying ordeal of the trip extremely well, and the light racing tires stood with but a few punctures until one gave out near the end of the trip. The riding speed was 12¾ miles an hour. Lieut. Wise is in the regiment of the Ninth Infantry, U.S.A. Such service as that represented by this ride might be invaluable in time of war or riot. One of the bushings split and six hours were lost by the rider in making a new one at a common blacksmith shop on the road. The performance shows the efficiency of the wheel for dispatch purposes.

The great perfection of the bicycle depends on the ball bearings, which eliminate so much friction from the machine proper, and reduces so largely the rolling friction between the wheels and the road by its principle of recuperation of energy. To some slight extent these improvements have been introduced among horse-driven vehicles, but a curious moral is to be drawn from the fact that it is only when man became his own vehicle propeller that the utmost refinements in the abolishing of resistance were introduced. It still seems as if the lesson of the modern bicycle had not been fully appreciated by the carriage builder. Within little more than three years the ordinary road wheel has been reduced in weight from forty or forty-five pounds to twenty pounds or even less.

Little further development in this line is to be, however, looked for immediately. Probably the lowest limit of weight for ordinary use has now been reached, and the minor points of width of tread, length of wheel base and similar features of proportion have been pretty well fixed.

America has made the most wonderful progress in the development of the wheel, and her manufacturers have been so alert and enterprising, competition so keen, and the public so critical, that the American wheel is to-day the most beautiful mechanism and the lightest and easiest running of any wheel manufactured in any country. The most defective feature of the wheel is the tire, which is very perishable and which is ill calculated to withstand the severe exactions of our bad country roads. It is believed, however, that great improvement will be made in this line during the coming season.

A RETROSPECT OF THE YEAR 1895.

The past year has been distinguished as much, unfortunately, by the loss of great leaders in the world of science and art as by the number and value of the discoveries and achievements that have marked its progress. A death roll which contains the names of our own Professor Riley, United States Entomologist, and of James Dwight Dana, and on the other side of the water the names of Pasteur and of Thomas Henry Huxley, is a sad one to contemplate.

Engineering.—In this department the greatest event of the year was the opening of the North Sea and Baltic Canal, which has a total length of 61 3/10 miles and cost $39,000,000. About the same time was opened the Harlem Canal to the north of New York City, which, though not remarkable for its size or cost, will have great commercial and strategic value, as uniting the East and North Rivers.

The Puget Sound and Lake Washington Canal, connecting the waters of the Pacific with a large fresh water lake in the Northwestern State of Washington, is progressing favorably. Of canals projected we note in the United States the Atlantic Coastwise Canal, from Philadelphia to New York, the Cape Cod Canal, and the canal from the Atlantic to the Great Lakes. The projected Nicaragua Canal has been somewhat set back by the report of the commission of experts, who have stated that the preliminary estimates were too small. It will be a far more costly work than was at first supposed.

During the year the contract has been let for cutting the longest tunnel in the world—the Simplon Tunnel, through the Alps. It will be 12¼ miles long, and will consist of two tunnels, spaced 56 feet apart, one for each line of rails. The contract price is $13,750,000.

Other great works that have been steadily advanced during the year are the Chicago Drainage Canal, in Illinois; the Peryar Dam, in India, which, when completed, will be 178 feet high, 1,300 feet long, and contain 5,000,000 cubic feet of masonry; and the great Siberian Railroad from Russia to the Pacific.

Transportation.—This year will ever be memorable for the great advance in railway speeds both in America and England. The remarkable long distance speed developed in the London-Scotland race, in England was followed by a similar acceleration in America, of both of which we give the results:

West Coast Route, London to Aberdeen	539·75	miles.
Average speed, including stops	63·24	"
" " excluding stops	63·93	"
New York Central, New York to East Buffalo	436·32	"
Average speed, including stops	63·54	"
" " excluding stops	64·22	"
Lake Shore and M. Southern, Chicago to Buffalo	510·1	"
Average speed, including stops	63·61	"
" " excluding stops	65·07	"

There has been a steady increase in the weight and power of locomotives. The driving wheels are being made larger and steam pressures are increasing, 180 to 200 pounds to the square inch being common.

Electrical traction has received some very important applications, notably in the 96 ton electric locomotives of the Belt Line Tunnel, Baltimore. These are doing excellent work, having on one occasion hauled a 2,000 ton train with facility and without any tendency to slipping of the wheels. Another important application of the system to a standard gage railway in this country has taken place on the N. Y., N H. and H. Ry., where a trial speed of 60 miles per hour has been obtained with a passenger train. In France a 90 ton

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electric locomotive, of the Heilman type, has been tested in experimental work.

Electric street traction has continued to grow in favor. In 1887 there were only 13 electric roads in the United States; to-day there are 850 roads with a total mileage of 10,000, representing an investment of $400,000 000. In this connection it is interesting to note that the possibilities of canal towage have been tested in both the old and new worlds; here in the form of a traveling motor, working separately from the boat, and in France by the use of a motor upon the boat itself, hauling upon a chain laid in the bed of the canal.

Under the head of transportation the year will be celebrated as seeing the practical development of the horseless carriage, or motocycle. In the Paris-Bordeaux race over 60 vehicles started; and the first two prize winners covered the 360 miles at the respective rates of 15 and 14·9 miles per hour, many of the other contestants making excellent time. In the Chicago race the winner made a speed of over 5 miles per hour through a course that was blocked with snowdrifts and mud—the results of a blizzard of the day previous.

The bicycle continues to enjoy an enormous and ever-increasing popularity. It has won its way this year into the highest circles, and when indulged in with moderation it has received increasing medical indorsement. This year has seen an extended use of wooden and aluminum rims, narrow treads, and larger bearings.

In naval and marine engineering, the year has shown that there is a continued tendency to increased size and speed in ships. In regard of speed a noteworthy performance was the U. S. steamer Columbia's transatlantic trip, at an average speed of $18\frac{41}{100}$ miles per hour. This is far beyond anything on record for a warship on a run of that distance. In the merchant marine, the run of the Cunard steamship Lucania, from Queenstown to Liverpool, 240 knots in 10 hours, is the record performance of the year; and it is even more creditable than her transatlantic record of over 22 knots per hour for the whole trip. The Buenos Ayres, a cruiser built at Newcastle for the Argentine Republic, steamed $23\frac{3}{10}$ knots on a six-hour trial. There is noticeable a growing tendency to increase the power of the quick-fire secondary battery of warships, and to decrease the weight of the heavier guns. The enormous energy of quick-fire is shown in a comparison of the energy of fire per minute of the Buenos Ayres, a 4,500 ton cruiser, with that of the Royal Oak, a 14,000 ton battleship. In the former case it is 304,844 foot tons, as against 292,830 foot tons in the larger boat.

In the United States Navy we have seen the launch of the Brooklyn, an improved New York. The Iowa, which, in power of heavy gun attack, will be the most formidable warship in the world, is nearing completion; and this year sees the practical completion of that famous trio, the Oregon, Massachusetts and Indiana.

A noteworthy event of the year was the speed attained by the torpedo destroyer Sokol. In making $30\frac{1}{4}$ knots, she was the first boat of any kind to pass the 30-knot limit.

The status of the United States merchant marine has been greatly raised by the addition of those two splendid vessels, the St. Louis and St. Paul, of the American line. They are of American material "from truck to keelson," and are the equal, and, in accommodation, the superior, of anything afloat.

The naval battles of the Japanese war have verified existing theories as to guns and armor. The development this year has been in the direction of higher velocity of projectiles and lessened weight and caliber of guns. At Elswick, we are told, "a muzzle velocity of 4,800 foot seconds has been obtained with a charge of cordite." This is nearly double the highest velocity of recent years. In armor the United States has continued to lead the world; and in other countries the developments have been along those lines of improvement first laid down by our manufacturers. The American system, which, briefly stated, presents intense hardness of face rather than thickness of metal to the shot, has up to this year succeeded in smashing the hardest shot that struck it. Reports now come from Russia of a successful perforation by a shot which is made on some secret system, which is supposed to consist in attaching a separate point, which is made of softer metal, to the head of the shot. Perhaps the most important event in the electrical world was the opening of the great Niagara Falls electric plant. Other successful plants for long distance electrical transmission of water power, that have been opened or enlarged this year, are those of Sacramento and Oregon City, respectively in California and Oregon.

The Glasgow Hydraulic Power Supply, opened this year, is remarkable for the high pressure, 1,120 pounds to the square inch, at which it is operated.

The most important event in the field of chemistry was the discovery of a new constituent of the atmosphere—argon—by Professor Ramsay and Lord Rayleigh. The discovery of this element explains the discrepancy which chemists have always found between the density of nitrogen obtained from the atmosphere and that obtained from chemical compounds. Atmospheric nitrogen was always heavier by the amount of argon that was present with it.

This year has seen the development, in useful commercial form, of acetylene, a brilliant illuminant, which is obtained by the action of water upon calcium carbide. As compared with the other hydrocarbons, methane and ethylene, the ratios of illuminating power are: methane $5\frac{2}{10}$, ethylene 70, acetylene 240.

In photography we note that at the soirée of the Royal Society at Dublin this year, Dr. Joly, of Dublin, presented some photographs in color, which showed "the same fidelity of reproduction that characterizes the camera."

The notable event in the medical world has been the successful treatment of diphtheria with antitoxine. This is one of those great triumphs of medicine whose benefit to mankind is beyond possible estimate. Professor Roux announces 74 per cent of cures on 300 cases, and Professor Erlich 85 per cent on 163 cases.

The geographical world has welcomed home this year from Polar expeditions Lieutenant Peary, the Jackson-Harmsworth expedition and Professor Borchgrevink. The efforts of the latter gentleman will probably result in the organization of an Antarctic expedition.

The present disturbances in the Turkish empire and the gathering of the European fleets suggest a possible rearrangement of geographical maps in Eastern Europe at an early date.

The industrial world has to record in America the holding of the Atlanta Exposition, at Atlanta, Ga.; and in Europe, the acceptance of the designs and the execution of other preliminary arrangements for the World's Fair to be held at Paris in the year 1900. The Atlanta Exposition will always possess special historical significance. It marks the coming of age, the ripening into the strength of full manhood, of what has very aptly been termed "the New South."

The ominous war cloud which darkened the relationship of the United States and England in the closing days of the year will be chiefly remarkable in history for the widespread expressions of mutual regard and goodwill which it immediately drew forth in profusion on both sides of the water, and for the equal abhorrence with which the possibility of what was aptly termed a fratricidal war was regarded by all classes of society in both countries.

Henry J. Newton.

The accidental death of this old veteran, yet modern photographer, 72 years old, on December 23, 1895, we are sure will be regretted by his many friends and others interested in photography. While crossing Broadway from the east to the west side between Twenty-third and Twenty-second Streets in this city, on Monday evening, December 23, he accidentally fell in front of a Lexington Avenue cable car which had just started, and before the car could be stopped he was crushed, and lived but five minutes.

Mr. Newton was born in Connecticut in 1823. He married and settled in New York in 1850. For the past thirty-five years he had lived in the Forty-third Street house. He was a member of the firm of Light, Bradbury & Newton, manufacturers of pianos, and in this business and through judicious investment in real estate in the northern part of the city, he amassed a comfortable fortune. A number of years ago he retired from active business and devoted himself to amateur photography. He was president of the Newton-Merritt Bronze Company, of Nyack, the business being conducted by his son.

He began the practice of photography soon after the introduction of the daguerreotype, and by research and experiments was able to suggest and introduce several useful improvements in photographic manipulation.

Having acquired the art of drawing and painting, and noticing the usefulness and adaptability of photography for obtaining details which it would be difficult to remember, he became infatuated with the new discovery and devoted himself earnestly to its improvement and perfection. He had his laboratory and skylight arranged on the top floor of his residence where he pursued his experiments. He recommended the use of nitrate of ammonia in the silver bath for the sensitizing of albumen paper, by which the need of preliminary fuming with ammonia is avoided.

About 1876-77 he improved the collodion-bromide emulsion process and prepared an emulsion by which dry plates as sensitive as those by the wet plate process could be made and used at any convenient time. He further suggested the use of the fixed alkalies such as carbonate of soda in developers in place of ammonia, and later, with the introduction of the gelatine dry plate process, advised the use of yellow prussiate of potash in the pyro developer, which gave the latter greater vigor and produced more brilliant negatives. He also recommended the single solution iodide of mercury intensification method for gelatine plates. Since the introduction of the coal tar developers he suggested certain modifications in their use for the development of prints on bromide paper, advising particularly the addition of, to a metol and hydroquinone developer, barium hydrate as yielding velvety black prints.

He made many beautiful photographs in Central Park, of the landscapes, sheep and other animals, and was also an expert in the development of instantaneously exposed plates.

He was identified with several photographic societies, and had been president of the photographic section of the American Institute for many years; also at one time he was vice-president of the Society of Amateur Photographers, of New York. Seldom has any amateur continued such a lively interest in photography as Mr. Newton did, and the photographic world has been much benefited by his investigations.

The funeral occurred on December 26, at the Church of the Divine Paternity, corner of Forty-fifth Street and Fifth Avenue, and was largely attended. Dr. Eaton and Dr. Collyer each paid eloquent tribute to Mr. Newton's memory.

Manufactured Iron and Steel.

The event of the week, as reported in the Iron Age for December 26, was the opening of the new set of bids for the construction of the Appraisers' Stores in this city. The figures submitted are the following:

	Bessemer.	Open hearth.
Post & McCord, New York	$339,550.00	$339,550.00
Benj. Hyde, Chicago	339,880.00	339,800.00
Pennsylvania Steel Company	341,313.00	345,591.00
F. J. Hyers, Hamilton, Ohio	344,400.00	366,400.00
M. Giblin, New York	352,220.00	356,220.00
Edge Moor Bridge Company	371,500.00	374,500.00
C. A. Schneider's Sons, Washington, D. C.	377,583.00	377,583.00
Passaic Rolling Mill Company	385,953.00	385,953.00
Youngstown Bridge Company	405,987.00	408,734.00
New Jersey Steel and Iron Company	406,600.00	406,600.00
Berlin Iron Bridge Company	419,844.00	425,947.00
Leach & Son, Chicago	429,393.00	398,763.00

The lowest bid made some time since was $419,000, but since then the plans have been modified, and where they formerly called for about 7,000 gross tons of material, the new plans, on which the above figures were made, required only about 6,000 net tons of material. It will be noted that quite a number of bidders quote exactly the same prices for Bessemer and for open hearth steel, while with a number of others the difference is only slight. We believe that this is the first conspicuous instance in which this has been brought out in the structural trade, the usual custom being to ask somewhat higher prices for open hearth. It is a somewhat striking commentary on the ability of the basic open hearth to come close to Bessemer in cost, on rigid specifications. We understand a Pittsburg mill has taken the material. We quote for large lots on dock: Beams, 1·68c. to 1·75c.; angles, 1·55c. to 1·60c.; universal mill plates, 1·60c. to 1·65c.; tees, 1·75c. to 1·80c.; channels, 1·70c. to 1·80c; steel plates are 1 50c. to 1·60c. for tank, 1·65c. to 1·75c. for shell, 1·75c. to 1·90c. for flange, 2·10c. to 2·25c. for fire box, and 2·25c. to 2·50c. for locomotive fire box, on dock. Charcoal plates are 2·25c. for shell, 2·75c. for flange, and ½c. advance for fire box quality. Refined bars are 1·35c. to 1·50c., and common are 1·25c. to 1·35c., on dock. Soft steel bars, 1·30c. to 1·35c.; steel hoop, 1·60c. to 1·75c. base. Steel axles, 1·65c. to 1·80c.; scrap axles, 1·70c. to 1·80c.; links and pins, 1·65c. to 1 80c. Best iron boiler rivets, 3c. to 3·25c. delivered. Steel rivets, 2·15c. to 2·25c.

Cycle Notes.

There are no very marked improvements in the bicycles for 1896, with the exception of larger tubing and barrel hubs. To those accustomed to a small hub, the barrel hub looks clumsy, but it allows the use of large balls in the bearing, and thereby decreases friction.

A tire stuck full of knives, tacks, etc., has been on exhibition in a Broadway store window, New York, for some time. This tire contains a layer of cork between the tubes. A cross section of the tire shows the cork to be crescent shape and one-third of an inch thick in the widest part. It is inclosed between two tubes of rubber, each of which is a seamless tube. The cork lining lies within the running surface of the tires, and if the outer tube is cut or torn, the inner air tube, being protected by the cork, remains good. It is said the practically puncture-proof quality does not seem to interfere with the resiliency of the tire.

The parcel carrier, which is a tricycle with a capacious carrier in the rear, is now a familiar sight in New York City. They are much more economical than delivery wagons.

French wheelmen have adopted a code of signals whistle. The whistle is much used in France in ference to the bell.

A bicyclist in England who killed a man by ing him down on the road was indicted slaughter, and is now serving a four months' of imprisonment at hard labor.

A New York expressman who ran dow woman was sentenced to nine months' im for reckless driving.

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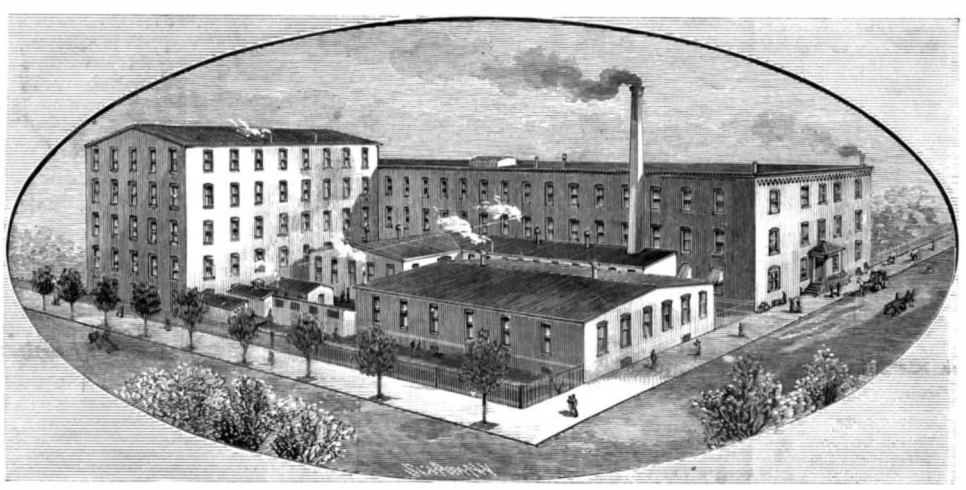
THE TRIBUNE BICYCLE.

Within the past three years, the American bicycle industry has grown up to dimensions which fairly entitle it to be considered representative of the country and of the day. Every day sees hundreds of wheels of high and low grade made in the factories of this country for the American and foreign market. Three years ago the English bicycle was considered by many the best wheel, and the possessor of such was apt to consider himself better equipped than his friend who rode one of American manufacture. Now, all is changed. A visitor to England or to the Continent, if a cycling enthusiast, cannot fail to be impressed by the superiority of American wheels as contrasted with the foreign ones, and no wheelman really au fait in his subject would dream of buying his wheel abroad, so superior is the American make. The industry has brought about an enormous development in the manufacture of special tools and of parts of bicycles.

Many assumed bicycle manufacturers simply buy these parts and do their own assembling. But for the production of the absolutely high grade American bicycle, a factory is required which will turn out practically all the parts of the wheel manufactured, for unless such is done one concern cannot be answerable for the perfection of the whole machine.

We select as the representative of such a factory the works of the Black Manufacturing Company, of Erie, Pa., a company which produce the highest grade of wheel and which put it on the market purely on its merits without the adventitious advertisement of paid riders. The wheel made by this company, the "Tribune Bicycle," embodies the best possible practice and is correspondingly free from structural variations of unproved merit.



VIEW OF EXTERIOR BUILDINGS—BLACK BICYCLE. MFG. CO.

The tubing, whose walls are of 20 gage thickness, is of American make, the company having found that English tubing could not be obtained of sufficiently even quality. At the junctions of the tubes forged connections are employed. These are received in a solid state and are machined out, drilled and turned, until only a shell of the original material is left. Each connection has projecting nipples which enter the ends of the tubes, and the whole is so accurately made that when the ends of the tubes are placed over the nipples the frame will hold itself together without further fastening. The tubes are of uniform diameter throughout and are simply cut of proper length, so that their natural strength is unaffected. The most striking instance of the preparation of the forged connections is in the crank bracket. This is received as a massive forging weighing 3 pounds 2½ ounces, in general shape a cylinder, with four solid projections. This is put into the finishing machine and finished. It comes out with the solid cylinder drilled out so as to present a large aperture through which the crank shaft is to go, and its ends faced off and finished for the reception of the ball races. The four projecting nipples are drilled out and are also turned down on the outside so as to fit accurately the outside of the tubing. The bracket now weighs 8 ounces; all the rest has been converted into drill chips. One of the typical connections is that used for the head of the rear forks, which forging we specially illustrate, in order to show how solid a construction is given to this vital point.

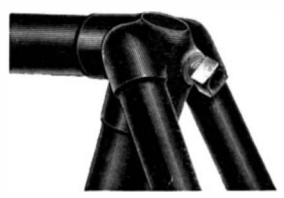
The frame has now to be brazed together. The pieces are placed in a massive iron jig or template, adapted to receive them and retain them in position, and which holds horizontally the entire frame. This template is mathematically accurate. While held therein, holes are drilled through the connections and tube ends and pins are driven in, pinning all the parts together. When removed from the jig the frame is perfectly rigid. It now goes to braziers, who, with the best quality of brass with large gas blowpipes, braze all the parts, quid spelter penetrating all the joints and running out around the pins. The frame oes to the filers, after the borax has been off it, who, with file and emery paper, go e connections and over the tubing, polishing removing every excrescence, which, it will be gives the frame an absolute hand finish over ace.

s taper toward the end, and to produce this taper cold swedging is employed. The swedging machine carries a heavy head like a lathe head or chuck, which rotates in a horizontal axis, and within which are eight hammers, which by the action of the machine move in and out in radial directions. A piece of cold tubing pushed into the machine and fed up by hand is subjected to a multiplicity of blows and has its diameter rapidly reduced, the workman being able to give it any desired taper. The metal thus tapered is flattened and bent to the proper curve to give one side of the fork.

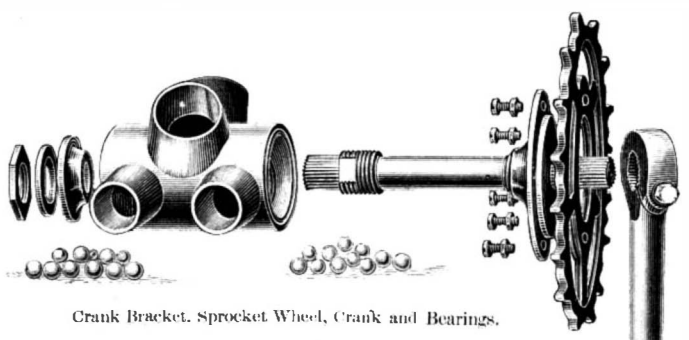
The cups and cones for the ball bearings are made on automatic turret lathes, the turret carrying in some cases as many as five tools. A bar of tool steel which may be 20 feet long is introduced into the machine and is gradually and automatically fed up to the tools, which shape and cut off from it bearing after bearing, which drop from it every few seconds without any attention from the workman. A liberal supply of oil is kept in constant circulation through the machine, falling upon the cutting tools. The bearings thus finished are purposely left 0·005 of an inch too large. They are then screwed on a mandrel in a special lathe and the final finish is given by hand. They are then tempered by secret process with sperm oil and polished, coming out with a beautiful straw color, equal in finish to any steel tools made.

The standard finish of the machine is black enamel and nickel plate. The enamel is put on in four coats, two of Inda rubber enamel and two polishing coats, the frame being rubbed down with rottenstone between the applications. This gives a finish equal to that of a piano body. To secure evenness the enamel is applied by dipping in a tank of the compound, after which the parts are hung up and allowed to drip to remove the surplus before baking. All nickel plated parts are first copper plated. This prevents water or moisture getting under the nickel and rusting the steel and thereby causing a separation of the coating.

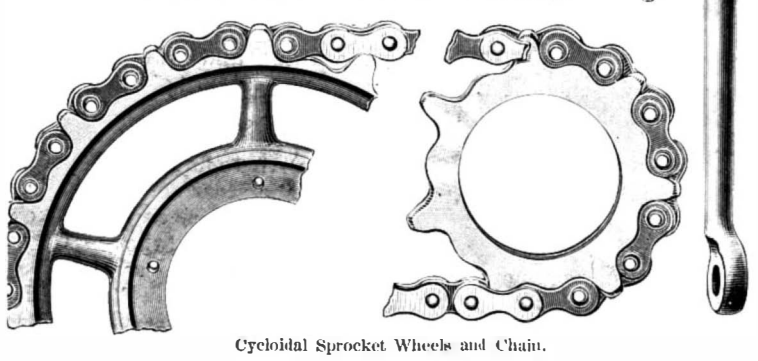
Handle Bar.



Head of Rear Forks.



Crank Bracket, Sprocket Wheel, Crank and Bearings.



Cycloidal Sprocket Wheels and Chain.

DETAILS OF THE TRIBUNE BICY

The aim of the constructor of this typical American wheel has been to secure simplicity and produce an absolutely standard article. Its criterion is its quality pure and simple. There are, however, some novelties introduced that are especially worthy of illustration. One of these affects the crank and crank shaft mechanism, the crank being secured to the shaft in a new way. V-shaped teeth are formed upon the crank shaft and upon the aperture in the pedal arm. This aperture in the pedal arm is split and provided with a tightening screw. To attach the crank arm to the shaft, it is thrust over the end of the shaft and the tightening screw is turned up, when it is secured as rigidly as if all were one piece of metal. Those who have struggled with the old-fashioned cotter will realize the advantage of this crank, which is instantly released with two or three turns of a screw.

The handle bar is made adjustable by an arrangement of equal simplicity and efficiency. The socket in the head which receives it is threaded. On the center of the handle bar is brazed a sleeve threaded with the same pitch of screw. The socket is split and provided with a tightening screw. The screw is loosened, the handle bar thrust through the socket and screwed into place. When at the desired angle the screw is tightened and the whole becomes practically one piece of metal. By reversing the handle bars, they can be used in up-turned or down-turned position.

The sprocket wheels ought not to be spoken of as a novelty now. They are cut to the cycloidal or theoretically correct curve, which avoids all friction of the chain against the teeth. This has long been the specialty of the Black Manufacturing Company, but now the system has spread among other companies, and cycloidal sprockets are characteristic of several other first-class wheels.

We also illustrate the system of truing up the wheel. Each wheel is mounted on a gaging frame, and the workman, by setting up and loosening the nipples, brings the rim into an absolutely perfect plane. The steering arrangement of the tandem machine deserves attention. Sprockets are carried by the front and rear steering posts, and these sprockets are connected by chains and rods so as to insure unity of steering action between the front and rear handle bars.

Wood Preserving in Switzerland.

A simple, effective, and cheap way of preserving wood from decay is practiced in Switzerland in the preparation of posts for the telegraph service. A square tank, having a capacity of some 200 gallons, is supported at a height of 20 feet or 25 feet above the ground by means of a light skeleton tower built of wood. A pipe drops from the bottom of the tank to within 30 inches of the ground, where it is connected with a cluster of flexible branches, each ending with a cap having an orifice in the center. Each cap is clamped on to the larger end of a pole in such a manner that no liquid can escape from the pipe except by passing into the wood. The poles are arranged parallel with one another, sloping downward, and troughs run under both ends to catch drippings. When all is ready, a solution of sulphate of copper, which has been prepared in the tank, is allowed to descend the pipe. The pressure produced by the fall is sufficient to drive the solution, gradually, of course, right through the poles from end to end. When the operation is ended, and the posts dried, the whole of the fiber of the wood remains permeated with the preserving chemical.—Work.

Oil of Cassia as a Refractive Medium.

Oil of cassia has a higher refractive index than cedar oil, and Dr. H. G. Piffard finds it brings objects examined in it into sharper contrast. In a paper read before the New York Academy of Medicine, he stated that he had worked with a sample having a refractive index of 1·593. Bacilli examined in this oil exhibited an unrivaled brilliance and sharpness of contour. The minuter details also, such as spores, flagella, etc., are shown with a distinctness impossible in cedar oil. The oil of cassia, like the oil of cloves, tends to abstract the color from bacilli stained with some of the aniline dyes, a disadvantage not shared by cedar oil, but it is stated that this does not take place with sufficient rapidity to interfere with the diagnostic examination.

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Ice Caves of Japan.

A correspondent to the London Field gives the following account of a wonderful cave in Japan:

Some eight or nine miles from Shoji, in the woods, is the entrance to the great ice cave we had come so far to see, a natural circular depression or basin in the ground in the middle of the forest, some thirty yards across and about forty feet deep. At the foot of one of the sides is a dark opening in the lava, a few feet down which may be seen the top of a wooden ladder. This is about twenty feet long, and at the foot of it are a heap of blocks of lava, down which we scrambled for some thirty or forty feet more, till a floor of solid ice, more or less flat, was reached. Very careful progress along this had to be made to avoid slipping down and extinguishing the torches. For the first fifty yards frequent blocks of lava rise through the ice of the floor, while further on there is nothing but ice. The lava roof is sometimes thirty or forty feet above one's head, sometimes only four or five feet from the floor. The light of the torches glanced continually on icicles many feet long pendent from the roof. Presently we passed some large blocks of ice, which had been cut by the country people for sale at Kofu, some miles off. At nearly four hundred yards from the entrance about twenty wonderful ice stalagmites, from two to five feet in height, rose from the floor close to a lava wall forming apparently the end of the cave, to meet icicles hanging from the roof from which water at this time of the year continually drops on to them. The tops of these stalagmites form hollow bell-shaped cylinders, giving out a faint note like a gong when struck; they are partly filled with the water which drips on to them from the icicles above. Soon by the side of them, on the left, a low arch in the lava on the level of the floor, about three feet high, may be seen. Down this is a strong current of air; there is a rapid descent for some thirty-five feet, and thence the course of the cave has been followed for another two hundred yards or so, but owing to the strong current of air which constantly extinguishes the torches, and the smallness of the passage, which slopes down rapidly from the entrance, no detailed description of it can be given; but undoubtedly the cave runs on for some distance, perhaps to another outlet, for the current of air is very strong at the extreme point to which any one has yet penetrated.

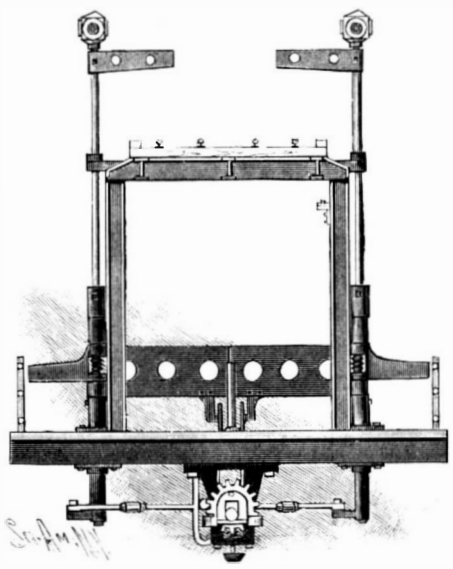
The ice has probably remained frozen in the cave from the winter months, the action of the higher summer temperature being insufficient to do more than affect the surface of the ice floor, form a few pools of water, and melt part of the ice stalactites and stalagmites. The temperature of the cave in summer seldom exceeds 35° Fah., and that in the declivity or basin in the ground at the entrance some 10° or 12° higher; on going up from the latter to the level of the ground in the wood, a rise of some 20° on a warm day is at once experienced.

The Argentine Cruiser Buenos Aires.

The latest cruiser turned out by the Elswick firm for a foreign government has just made her trials and has made a speed which, if not altogether unprecedented, is most creditable to her designers, and must be satisfactory to her owners. The length between perpendiculars of this ship is 396 feet; her beam 47 feet 2 inches; and normal draught 17 feet 7 inches; the displacement being rather over 4,500 tons. It has the usual protective deck and in general design resembles all the cruisers that have been turned out by this firm. The guns, carried in protective positions fore and aft, are two of the new 8 inch quick firers, while between these, in the open battery, are ten other quick firers, four of them being 6 inches and the others 4·7. In addition, there are sixteen three-pounders and eight one-pounder guns, with five torpedo discharge tubes. The machinery, supplied by Humphrys & Tennant, consists of two pairs of inverted direct acting, compound engines, steam being supplied by four double-ended and four single-ended boilers. The power used on the run was 14,000 H., the steam pressure being about 15·5 pounds and the vacuum 28 to 29 inches. The speed attained was 23·2 knots with natural draught.

IMPROVED DRAWBRIDGE GATES OPERATING MECHANISM.

To simplify and cheapen the opening and controlling of the gates of drawbridges, where the mechanism is actuated by the opening and closing of the drawbridge, the improvement represented in the accompanying illustration has been patented by George F. Ryan, and is being introduced by Joseph L. Duplissis, of Nos. 6357 and 6359 Champlain Avenue, Chicago, Ill. The large engraving is a side view of one end of a

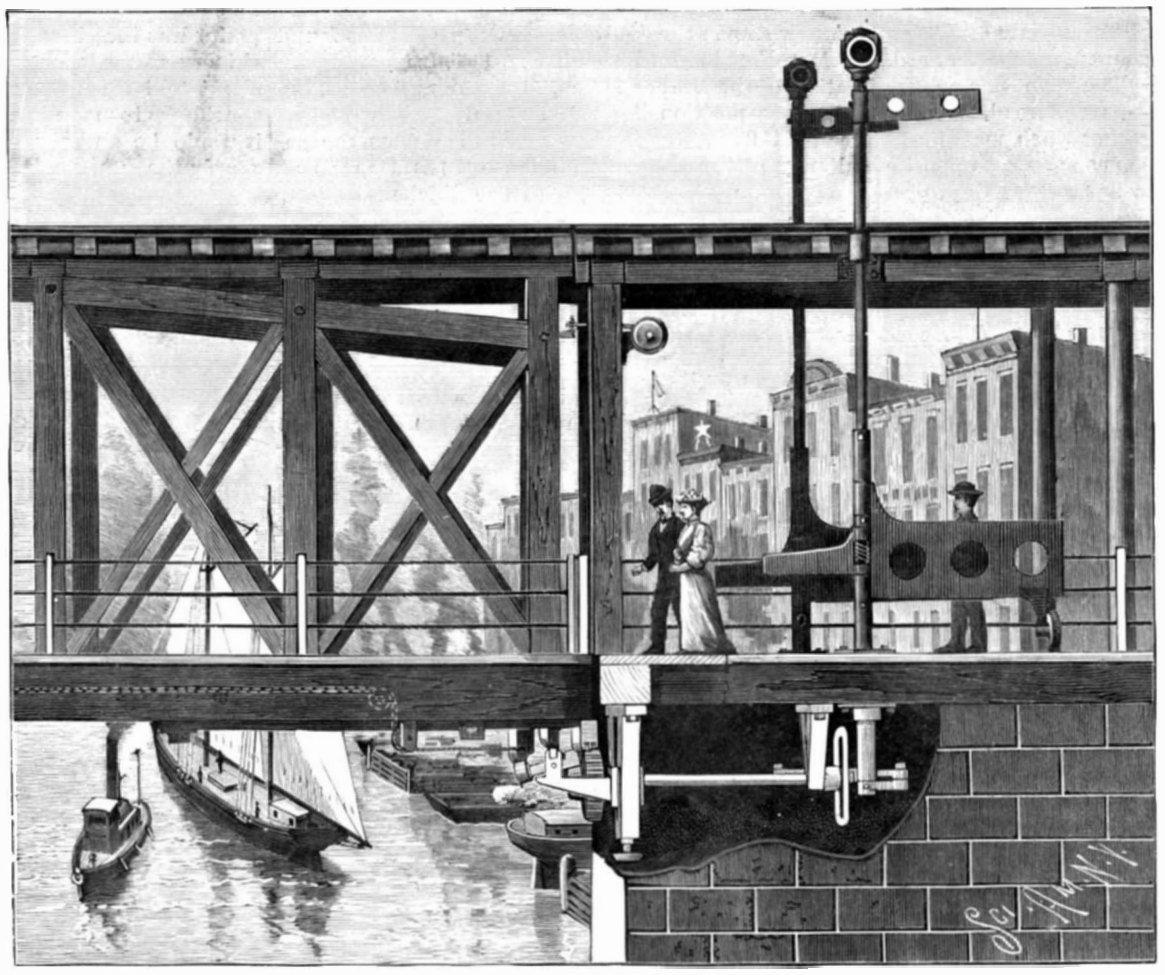


DRAWBRIDGE GATES OPERATING MECHANISM—END VIEW.

bridge on which the improvement is applied, and over which is also carried an elevated railway, the adjacent abutment, the gates and the operating and controlling mechanism being shown, and a portion of the abutment being broken away to show the parts beneath the roadway.

The drawbridge, which revolves about an axis at its center, has curved ends, there being a corresponding curve in the abutment, and on each side of the roadway is a gate post, preferably surmounted by a lamp with lenses of colored glass for signaling purposes, the post being suitably stepped to maintain it firmly in place. Immediately beneath the lamp, on each post, is a short arm or plate, for use as a signal, as such device may be operated for the elevated railway simultaneously with the gates. For the driveway and sidewalks the gates are so mounted as to yield when they meet obstructions, and the driveway gate is attached to sleeves fitting loosely on the post. The movement of the gate is limited by an adjustable stop, in connection with a coiled spring, preventing injury to a person who may be caught between the gates as they are closing. The sidewalk gates are yieldingly held by coiled springs attached to the post and engaging opposite sides of each gate.

In opening or closing the gates the posts are turned in opposite directions, each post being moved a quarter of a revolution by a toothed rack carried by the bridge engaging a pinion on a shaft which has at its other end a crank arm, a wrist pin on this crank arm engaging a rod pivotally connected with crank arms on the posts. This rod is made up of a number of parts, made endwise adjustable by turnbuckles, and has at its middle a loop or eye into which projects the wrist pin. The pinion shaft is carried by a pair of hangers, one of which permits partial movement to the end of the shaft carrying the pinion, enabling the latter to accommodate itself to changes in the vertical position of the end of the bridge, the end of the shaft being normally upheld by a coiled spring. A cam on the under side of the bridge also engages an anti-friction roller on a bracket embracing the pinion, whereby the latter and its connected parts are depressed, when necessary, to the proper position for engagement with the rack. Provision is also made for closing the gates as desired, when the bridge is closed and at rest.



RYAN'S IMPROVED MECHANISM FOR OPERATING DRAWBRIDGE GATES.

Where Pennies are Coined.

It is not generally known that all the minor coins of base metal, such as pennies and nickels, are made at the Philadelphia mint, and that nearly 100,000,000 pennies are coined here every year. This large number is occasioned by the fact that thousands of pennies are lost annually, and the government has some difficulty in maintaining a supply. The profit of the government on their manufacture is large. The blanks for making them are purchased for $1 a thousand from a Cincinnati firm that produces them by contract. Blanks for nickels are obtained in the same way, costing Uncle Sam only a cent and a half apiece.

Gold is coined in Philadelphia and San Francisco. Not enough of it comes into the mint at New Orleans to make the coinage of it worth while. Gold pieces are the only coins of the United States which are worth their face value intrinsically. A double eagle contains $20 worth of gold without counting the one-tenth part copper.

Extraordinary Railroad Into the Black Hills.

A remarkable piece of engineering is to be seen on what is known as the Spearfish branch of the great Burlington Railroad system in the Black Hills, over which a Chicago Record reporter recently traveled. This branch runs from the little town of Englewood, ten miles south of Deadwood, in a northwesterly direction, to the town of Spearfish, a distance of thirty-one miles. For a greater portion of the distance after leaving Englewood the road is steep up-grade, the grade being at several points three and four feet to the hundred, finally reaching the very summit of the Black Hills, after passing around innumerable curves of so abrupt a nature that passengers are led to wonder how the train can keep the track, and through numerous cuts that have been blasted out of the solid rock.

At one or two of the most dangerous places on this remarkable road safety switches are in use. In descending the grade, should the train get beyond control, these switches will carry it around the points of mountains and up a steep grade, enabling the engineer to regain control of the train. The road is ballasted with broken rock, not even a shovelful of dirt being visible on the entire roadbed.

The cost of constructing the thirty-one miles of road was $1,750,000. The engines in use are 100 ton engines, but, owing to the steep grades, they are unable to haul more than three loaded ore cars.

At one point the road makes a curve of seven miles to reach the higher grade, and, if the tracks were on a level, the upper one would be within a few hundred feet of the lower track of the "loop."

Notwithstanding the dangers attendant upon railroading on this winding mountain road, but few accidents have occurred. At intervals trains are stopped for the purpose of testing the air brakes, and the utmost care is taken to prevent disasters. On the entire thirty-one miles of road there is not more than two or three hundred feet of continuous straight track.

THE deepest artesian well is at Budapest. Depth, 8,140 feet.

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BICYCLE FRAME IMPROVEMENTS.

The accompanying illustrations show the methods used in putting together the sheet steel frame connections and the continuous crank shaft and cranks of the 1896 bicycle of the Barnes Cycle Company, Syracuse, N. Y. These frame connections are made by punching from a fine grade of drawing steel the necessary blanks, and forming them with special tools in press, so they will fit inside of one tube, going through a slot in the tube, the outer end to be formed so as to fit in another tube which is milled out the proper form to butt up against the first tube. These connections have pointed continuations which act as reinforcings, stopping the vibration, and lessening the chance of broken frame tubes from this cause. Besides these connections there are other pieces formed up to fit in each half of the main connection so as to give a brazing surface at the bottom, and one entire side also on the curved side, which, after being brazed up with the other pieces, form the strongest possible joint in use. All of these connections are riveted together and riveted to the tubes before being brazed, and are put together in such a manner that they would hold, if necessary, without being brazed. This pattern of connection is used in both heads, seat pillar and bottom bracket connection, as shown in Figs. 2 and 4. The rear fork connection also of this machine has an internal joint which is left smooth on the outside, and is made entirely of sheet steel formed and brazed as in one piece. The handle bar and seat post fastenings of this particular machine are made by reaming out the lower end with a taper reamer, and inserting a brass and taper nut, which, when drawn up by the long screw seen in the cuts, spreads the lower end of the tube, which is slotted, and holds it firmly in position. After a few seasons' use this has proved to be a most satisfactory method of fastening the handle bar and seat posts. In the lower end of the seat posts, the tube of which is lighter in gage than the handle bar post, a reinforcing tube is first brazed in, making the tube at that point of double thickness, this being reamed out with a taper reamer and not allowing any chance of spreading the seat pillar tube in the frame.

The saddle (Fig. 5) is held on the straight seat post by a hollow screw and clamp which holds the springs firmly on the upper end of the post, which is milled out the proper shape to fit the springs after the necessary reinforcings have been brazed in. The long, slim screw which tightens the brass nut at the lower end of the seat post passes through the hollow screw, which holds the saddle in position on the post, both of these screws being operated by an ordinary monkey wrench, a flat spanner or a T-shaped socket wrench.

The crank shaft forging is made of a high grade crucible steel in one piece, and the bearings are all of crucible steel, hardened, tempered and ground afterward, so they are perfectly aligned. The stop cone on the crank shaft (Fig. 3) is on right-hand thread, which is self-tightening against the sprocket when machine is running forward. The adjusting cone on the opposite end is slotted, and the washer has two small projections, as shown in the cut, engaging these slots, and, in connection with the projection on the inside of the washer, which fits a slot milled on the crank shaft, prevents the cone from working tight or loose, and keeps the bearings perfectly adjusted. One of these machines has been ridden for some time with the lock nut merely turned up with the fingers, which held it firm enough to not loosen, although the lock nut is intended to tighten up with a wrench perfectly solid.

The bearings cases are screwed in the bottom bracket, the right one having a right-hand thread, and the left one having a left-hand thread, so they both remain screwed up tight and are not affected by the revolving motion of the bearings. These machines are made in several patterns, including the Special, the White Flyer, the Superba, the Racer and the White Flyer Tandems.

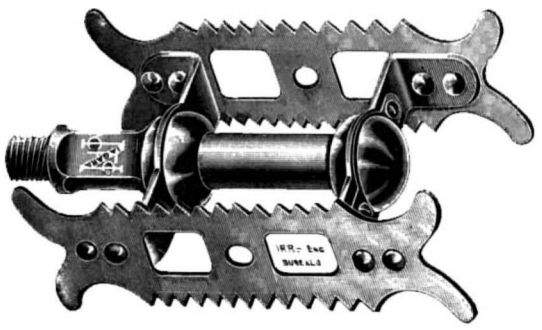
BICYCLE FRAME IMPROVEMENTS—HANDLE BAR, SEAT POST, CRANK AND SADDLE CONNECTIONS.

JAPAN is going to build up her commercial navy by giving subsidies to shipbuilders for every ton above 1,000, and to shipowners for all ships of 1,000 tons that can make ten knots an hour, the subsidy being increased for every 500 tons additional burden or every knot additional speed.

"NIAGARA" BICYCLE PEDALS.

The manufacture of bicycle pedals has become an industry separate and apart from everything else connected with the wheel. Until a few years ago the pedals used by the general trade outside of the great factories were brought from Europe, but American manufacturers are now turning out these goods in large quantities. The Niagara Cycle Fittings Company, of Buffalo, make a line of pedals which have been well known since 1891, as their "Niagara" is now represented by some 500,000 pairs in daily use.

We illustrate one of the many styles of pedals turned out by this company, the "Niagara Middleweight," especially designed for hard work on road wheels. It is of the improved central bearing pattern,



THE "NIAGARA" BICYCLE PEDALS.

a long space being left between the inner bearings and the crank, and this portion of the pedal pin or shaft being square. Nothing is so annoying to the bicycle rider as to have his pedal constantly coming loose, and to avoid this, the Niagara is arranged to admit of screwing the pin into the crank with a big wrench, making it practically impossible for it to unscrew. The foot plates are fastened to the frame with a series of separate rivets. On their lighter pedals it is customary to rivet the two portions of sheet steel on forgings together direct, but in case of accident or breakage this requires new parts to supplement the old ones, while by the use of separate rivets the repair of the broken pedal is greatly facilitated. For riders who desire to save their shoe leather from the saw teeth of the pedal plate, a rubber with an H-shaped washer to hold it in place is provided for each pair of pedals, and can be attached and detached at pleasure. The bearings are covered, the outer one by a cap and the inner one by a collar, to protect them thoroughly from the dust, and the center between the bearings is covered with a nickel plated brass tube. The daily product of these pedals at the factory of the company sometimes runs as high as one thousand pairs.

A New Star in Centaurus.

A new star in the constellation Centaurus was found by Mrs. Fleming on December 12, 1895, from an examination of the Draper Memorial photographs. Its approximate position for 1900 is in R A. 13h. 34·3m., Dec. —31° 8′. Attention was called to it from the peculiarity of the spectrum on Plate B 14,151, taken at Arequipa on July 18, 1895, with the Bache telescope, exposure 52m. The spectrum resembles that of the nebula surrounding 30 Doradus, and also that of the star A. G. C., 20,937, and is unlike that of an ordinary nebula or of the new stars in Auriga, Norma, and Carina. This object is very near the nebula N. G. C. 5,253, which follows 1·28s, and is north 23′. No trace of it can be found on fifty-five plates taken from May 21, 1889, to June 14, 1895, inclusive. On July 8, 1895, it appeared on a chart plate, B 13,965, and its magnitude was 7·2. On Plate B 10,472, taken July 10, 1895, its magnitude was also 7·2. On December 16, 1895, a faint photographic image of it, magnitude 10·9, was obtained with the 11 inch Draper telescope, although it was very low, faint, and near the sun. On this date, and on December 19, it was also seen by Mr. O. C. Wendell with the 15 inch equatorial as a star of about the eleventh magnitude. An examination with a prism showed that the spectrum was monochromatic, and closely resembled that of the adjacent nebula. Although the spectrum is unlike those of the new stars in Auriga, Norma, and Carina, yet this object is like them in other respects. All were very faint or invisible for several years preceding their first known appearance. They suddenly attained their full brightness and soon began to fade. Like the new stars in Cygnus, Auriga, and Norma, this star appears to have changed into a gaseous nebula.—Harvard College Observatory Circular.

New Submarine Boat.

The Goubet resembles a whale in shape, being spindle shaped and measuring 26 feet in length and about 5 feet 6 inches in diameter in the middle, with a capacity of 10 tons. It is cast in three sections of gun metal, which are bolted together. The middle section is surmounted by a dome, also of gun metal, about 1 foot high, by which access is obtained to the interior. The hull is about 1 inch thick in the middle and about one-third of this only toward the ends, but this gives sufficient resistance to navigate at any depth in the English Channel. The boat is propelled by a screw, which also serves the purpose of a rudder, the shaft being jointed to enable of its being moved right or left. The horse power is extremely small (one or two), this, it is said, being sufficient under water, where there is no wave making, to give seven or eight knots. The motive power is supplied by an electrical battery. The boat may be rowed backward or forward by a pair of fin-like arrangements to the fore. When the boat is in harbor the dome emerges. When this is closed, and the boat sets out on the warpath, water is let into compartments in the lower part of the boat, which gradually sinks. The quantity of water is regulated by very ingenious automatic apparatus, and when the Goubet is sunk to any required depth, at that depth it remains, the screw propelling it in a horizontal plane.

American Fruit Packages.

American fruit packages are becoming more and more popular in the Mediterranean trade. It is believed that the fruit producers of Italy will adopt the more modern fruit packages used in the United States. An importer of fruit, resident in New York, has recently visited Italy, and was present at a conference held by the ministry of agriculture of Italy, and he showed them the various boxes, crates, baskets, and the like which are used in the United States. The Italians had never before seen such packages, and their complaint was that they had neither the wood nor the machinery to manufacture them. The New York merchant told them that, as the United States produces the shooks to make boxes for their oranges and lemons, it would be an easy matter for the same country to supply the same packages, at a nominal cost. If these are generally adopted, the United States lumber interests will be benefited. In any event, as the Italian fruit grower becomes acquainted with our modern appliances, he will either purchase the manufactured article in this country or will buy proper machinery and wood here to develop that industry. At all events, it means an enlarged demand for hard wood fruit packages from the United States, either in the form of wood or the manufactured article.—N. E. Lumberman.

Aluminum Coffins.

Coffins are now made of aluminum. Like the modern square burial casket, the aluminum coffin is made of uniform width, with square ends and vertical sides and ends. It is finished with a heavy moulding around the bottom and at the upper edge, and with pilasters at the corners, and has a rounded moulded top. It is provided with extension bar handles. The aluminum casket is not covered, but finished with the metal surface burnished. It is lined in the usual manner. The weight of a six foot aluminum coffin is 100 pounds. A six foot oak casket weighs about 190 pounds, and a cloth casket of the same size with a metal lining about 175 pounds. Other metallic caskets weigh from 450 to 500 pounds. The cost of aluminum coffins is from $750 to $1,000.

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[ANTHONY'S BULLETIN.]

Preparing Silver Paper.

We have for some time past felt the need of a good silver printing process suitable for intermittent work, when silver printing may only be required at intervals of weeks or months. Albumenized paper, if kept in stock, is likely to be found spotted, when wanted, from the extreme damp of the rainy season; and, on the other hand, if the weather is at all dry, the prints curl up and are difficult to keep in good order unmounted. The varieties of gelatino chloride paper (P.O.P.) are very difficult to work in this steamy climate, the paper does not keep in good order, is expensive and not always obtainable when required.

We have latterly been using plain salted paper containing a good quantity of gelatine in the salting solution, but even with this it is very difficult to obtain bright prints except from very strong negatives, and the image was always more or less sunk and flat. Increasing the gelatine and adding a little chrome alum to harden it gave much better results, but it was difficult to prepare the paper with a good, even coating without a proper machine for the purpose.

I was very glad, therefore, to see in the British Journal of Photography for August 9 a paper, read by Mr. G. H. Moss before the South London Photographic Society, on "The Preparation of Plain Salted Silver Paper," and more so, on trying his formula, to find that it answered perfectly and practically solved the problem, so far as our work is concerned, and proved itself to be an effective, simple and inexpensive silver printing process, with many special advantages of its own. It is more suited for thick paper than for thin, and the prints show a rich tone, with plenty of brilliancy and detail in the shadow.

The main peculiarity of Mr. Moss' process is, that no colloid material, such as gelatine, albumen or starch, enters into the preparation of the sensitive paper beyond that already contained in the sizing, the advantage of this being that the unstable compounds, which gelatine and albumen form with silver salts, are absent or only present in very small proportion.

The difficulty was to obtain vigor and keep the image on the surface without the colloid, and after many experiments he adopted the following formula for the salting solution:

Sodium chloride in crystals, not table salt	150 grains.
Ammonium chloride	100 "
Potassium bichromate	4 "
Water to	20 ounces.

The bichromate gives vigor to the image, and may be increased for very thin negatives and lessened for hard and dense ones.

Whatman's drawing paper, or Rives' paper, is soaked in this solution for three to five minutes, and hung up to dry. If not required at once, the salted paper can be kept, and is said to improve by keeping, no doubt by the action of the bichromate on the sizing of the paper.

The salted paper is sensitized by floating for about two minutes on the following bath:

Silver nitrate	400 grains.
Citric acid	150 "
Water	10 ounces.

After sensitizing, the surface will be a light primrose, and care must be taken to avoid air bubbles.

The paper when dry is very sensitive, and should be printed rather deeper than desired. The toning can be done as for P.O.P., with a bath of about half the strength. We have found the borax bath in ordinary use answer well. The prints must be well washed after toning and then fixed in hypo solution, 1 to 10 of water, for about ten minutes for thin papers, or up to twenty minutes for rough and heavy papers. After fixing, the prints should be well washed for two hours in constant changes of water.

The paper keeps well after sensitizing, and this is a further great advantage. The absence of colloid material or of any sulphur compounds, as in albumenized prints, tends largely to the permanence of the prints. With reasonable care in fixing and washing, and by using fairly pure papers for salting, the prints may be expected to resist outside influences for a considerable period, not so long, perhaps, as platinum or carbon prints, but certainly much longer than silver prints prepared with albumen or gelatine.

The process seems really a useful one, well worth attention, especially of residents in warm climates.

COL. J. WATERHOUSE.

Gold Beneath the Lava.

The great lava flow covers a section of country in Idaho four hundred miles in length by forty to sixty miles in width. It lies in the southeastern part of the State, on and along the course of the Snake River, and mostly on the north side of that stream.

After flooding the great plain lying to the southward, the lava turned and flowed backward to the north. There it flowed into the mouths of the valleys lying between the foot hills, filling all the streams that flowed out toward the south. The streams thus checked and dammed presently found passages beneath the porous lava, and now flow under it from thirty to fifty miles, to reappear as large springs or to burst forth in cascades and tumble down the walls of basalt that border Snake River. On the line of the back flow, up toward the northern foot hills, lies the most ragged and forbidding portion of the great lava plain.

These lava flows covered rivers, creeks, canyons, valleys, and even basin regions filled with low hills. Many of the streams, gulches, flats, and basins in the country surrounding the lava-covered section on all sides have been wonderfully rich in gold, wherefore it is reasonable to suppose that many of those covered by the lava are also rich in the same way.

The Snake or Shoshone forms the great center of the Idaho river system. It has a course of 850 miles within the State, and, with its branches, drains nearly the whole country. The Clearwater, the Salmon, the Weiser, the Fayette, the Boise, the Lemhi, the Owyhee, and other rivers, tributary to the Snake, were wonderfully rich in gold. The Yankee fork of the Salmon and many other creeks were exceedingly rich in the yellow metal. Rich placers were found in the streams that formed the Boise River in 1862; in the year following in the tributaries of the Owyhee and many other places. The valleys of the Weiser and Fayette, constituting what was known as the "Boise Basin," was one of the richest placer regions ever found.

What are called basins in Idaho are not bowl-shaped depressions, as many suppose, but are sections of low country surrounded by large mountains. Within the basins are many hills and creeks. The Florence Basin was astonishingly rich and many others were little behind it as producers. Prior to 1868 these basins and other surface diggings in little flats and on gulches produced $45,000,000. Up to 1873, by which time most of the famous placers had been worked, the yield from the surface diggings amounted to $75,000,000. Then began the rich discoveries in quartz, but placer mining is still continued and occasionally rich finds are made.

From what has been said of the rich deposits of gold in the basins, valleys, gulches, flats and streams of Idaho, it is reasonable to suppose that under the great lava flow covering an immense area—not less than 20,000 square miles—in the heart of the auriferous region, must lie many exceedingly rich deposits of gold.

The gold placers of both California and Idaho are countless ages older than the lava flows. In California the channels of the ancient rivers beneath the lava are much richer than those of the modern rivers and placers. This is because the channels of the ancient rivers had served as bedrock sluices for untold ages before the disturbing lava flows began. The present rivers of California received the greater part of their gold by their cutting across and carrying away great sections of the rich channels of the ancient rivers. —Dan De Quille, in the Engineering and Mining Jour.

Our Defenseless Condition.

Senator Cullom, speaking recently on the Monroe doctrine, said:

In this connection I desire to call the attention of the Senate to a conversation which I see quoted here as having taken place in China between Mr. Curtis, a very able correspondent, and Mr. Li Hung Chang, the Chinese Viceroy. Speaking to Mr. Curtis about this government, Li Hung Chang said:

"Your government and your people are very unwise if they are not thinking of such things."

Referring to our naked condition of preparation for war.

"Particularly since the events that have occurred in China during the last year. The Japanese are a very aggressive people. They are a warlike people. They like to fight, and they are proud and arrogant. They do not care for the United States, except as a market for their silk and tea, and if your government ever interferes with their plans, either at home or in the Sandwich Islands, you will find that their friendship is only a pretense they keep up to encourage your trade. If President Cleveland had responded to my appeal for intervention during the late war, Japan would have sent her army and her ships from our harbors over to your country and would have taken possession of your Pacific States."

Mr. Curtis says he tried to explain the situation to Li Hung Chang, but "the Viceroy sneered in a contemptuous manner," and said:

"Japan has an army of over 200.000 soldiers and the best guns in the world."

I suppose he realized that from China's experience in the late war.

"She has a larger and better fleet of war ships than the United States. She has ten times as many torpedo boats as your government, and her sailors know how to use them, while yours do not. You have only five ships on the Pacific coast, with a coast line of 3,000 miles to protect, and several populous and wealthy cities with no defenses whatever. You have no forts at San Francisco that could keep out the weakest gunboat in the navy of Japan, and a single ship of the Japanese navy could destroy every city on Puget Sound without the slightest difficulty in a week."

Correspondence.

The Duryea Motor.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of December 14 you state that of the four gasoline wagons in the Chicago contest, "The Duryea, the Benz-Mueller, and the De la Vergne wagons used modified Benz motors." This is an error, in that the Macy wagon should have been reported as using a Benz motor, instead of the Duryea.

The Duryea wagon uses a motor of new and light design, and, like the wagon, thoroughly American. The Benz motor is a single cylinder, with a heavy fly wheel, and is supplied with gas from a carbureter.

The Duryea motor is a double cylinder, with balanced pistons, light fly wheel, and no carbureter at all. It was designed especially for the purpose, after several years of experimenting with wagon motors, and is not in any sense a copy of or an improvement on any foreign motor. CHAS. E. DURYEA.

Peoria, Ill., December 19, 1895.

Weather Bureau Reports on Envelopes.

We received a newspaper clippling from a Buffalo (N. Y.) correspondent advocating the use of the Post Office for disseminating Weather Bureau intelligence. We referred the matter to the Weather Bureau, and received the following reply:

SCIENTIFIC AMERICAN, New York City:

Sirs: In reply to your communication of the 16th instant, inclosing newspaper clipping and letter from your correspondent at Buffalo, relative to stamping weather forecasts on letters, I have the honor to inform you that the proposition is not to utilize the cancellation stamp, but the "back" stamp. The idea was suggested at the Convention of State Weather Service Directors held in Indianapolis, October 16-17, 1895, by Mr. Frank P. Chaffee, Local Forecast Official, Montgomery, Ala. As the plan was regarded with favor, efforts have been made to give it a practical trial. Should the tests which are now being made in a limited way result satisfactorily, it is possible that the plan may be put into general use. Very respectfully,

WILLIS L. MOORE,
Chief of Weather Bureau,
United States Department of Agriculture.

The Bridge of an Ocean Liner.

Let us spend an hour with Captain Randle, of the American liner St. Louis, on the bridge in midocean. He first takes us into the wheel house. It is a room about ten feet long and ten feet wide, with a curved front. A wheel about three feet in diameter is placed in the center of the room, and you are surprised to see that the quartermaster keeps turning it almost constantly. You have always thought that he had simply to keep his eye on the floating compass in the box directly in front of him and hold the ship steady in her course. As you look at the compass you see the ship veering now this way and now that as she rolls and plunges, or as one screw turns faster than the other, and thus pulls the ship around. It is hard to make two independent screws go at exactly the same speed, and so this man at the wheel is busy all the time turning the ship straight. He has to fight the waves and the screws and the winds at the same time, and he is a busy man.

This steering wheel controls the ship by means of a small column of oil in a little tube. By turning the wheel this way or that the oil in the tube is forced up or down, and that opens or closes certain valves in the steam steering gear four hundred feet away, and the rudder is turned as easily as if a child had done it. In most steamships the steam steering gear is controlled by hydraulic power—that is, by water—but the use of a column of oil is an improvement.

As you look about, you see fastened to the cornice, directly in front of the wheel man, a little scale in black with white lines marked off on it. There is a dial on it, and as the ship rolls you see that this is a device to mark the degree of a roll. You may notice that it takes about a second for every degree of a roll. On each side of the room is another long black gage, and the dials point to certain figures, generally between ninety and ninety-five. These dials are little electrical devices, showing exactly how many revolutions the screws are making. The captain, at a glance, knows what is going on in the engine rooms.

Over in the corner of the room is another curious electrical device.* It is a little box with a clock in it. The captain tells you it is the machine that controls the whistle in time of fog. The law requires a long blast of the whistle at such times every two minutes. By pressing in a button on this little clock apparatus, and by setting the clock in a certain manner, the whistle is blown automatically for seven seconds every minute. There can be no error of man in that work. Just as sure as every minute comes around that whistle will blow seven seconds. Under the old way, when a man pulled the whistle cord, there was no exactness in the work. When the fog is over the button is released and the whistle stops.—Harper's Round Table.

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ACETYLENE APPARATUS.

BY T. O'CONOR SLOANE, PH.D.

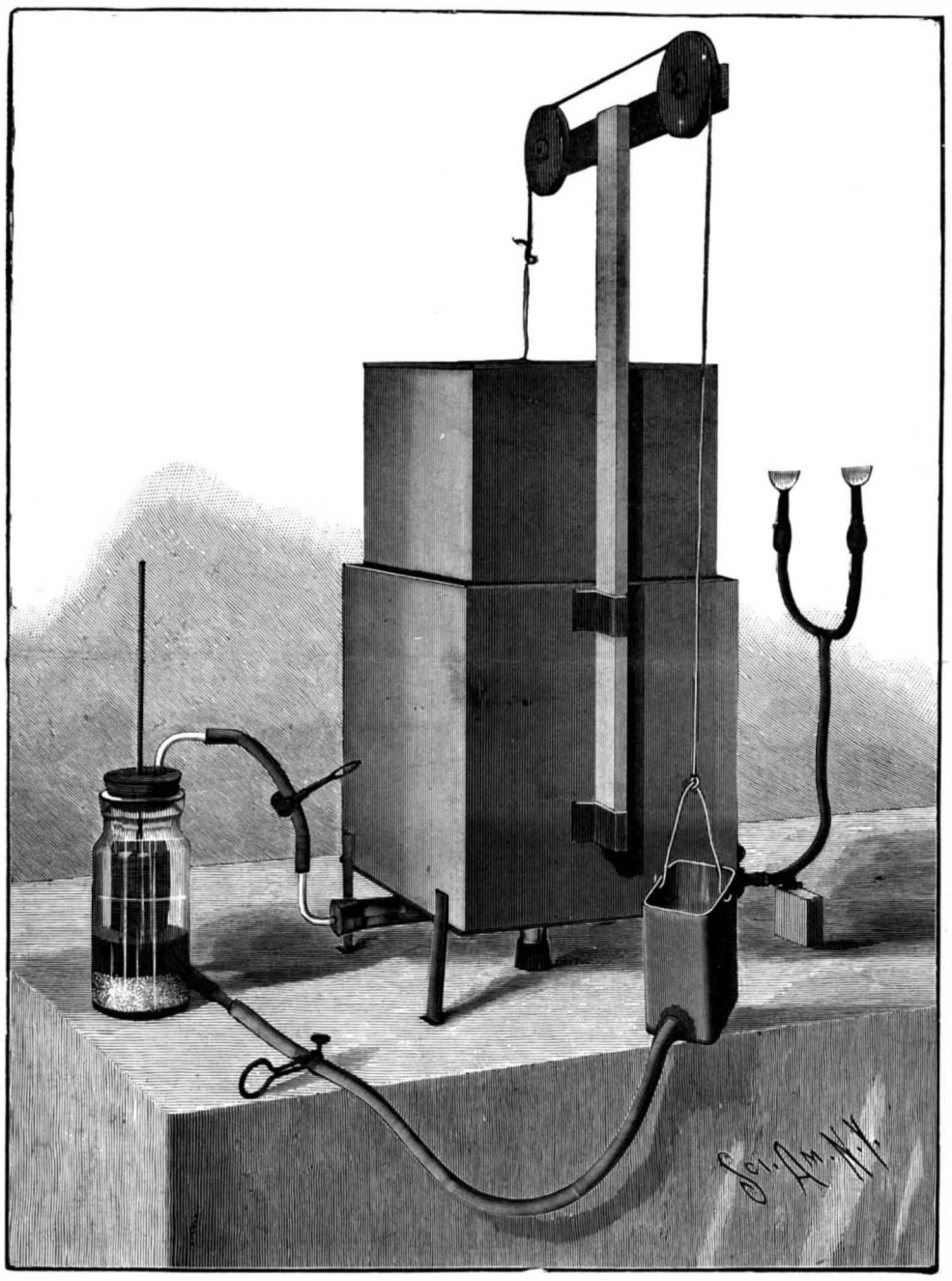
A very simple apparatus for the production of acetylene gas, which, if the proper proportions are preserved, will work automatically for many hours, is illustrated in the cut which accompanies this article. The general requirements for a successful acetylene gas apparatus make a gas holder of some kind almost a necessity. The varying level water pressure apparatus which we show in our issues of March 30, 1895, and December 7, 1895, are unsatisfactory, except as regards their simplicity of construction. In apparatus of their type, when the calcium carbide is to be replenished, complete cessation of the gas delivery is required; and after the replenishing has been effected some little time is required to get the apparatus into working order again. From considerations of safety it is also in accordance with good practice that the apparatus shall automatically remove the water from the carbide when the evolution is too rapid.

In the apparatus shown, the gas holder, of about one-half cubic foot capacity, is arranged for the storage of the gas, and with this gas holder is connected the evolution pipe and the apparatus in which the gas is produced. An excellent gas holder can be made, as was the one shown, out of two biscuit boxes, one inverted within the other. A single pipe passing through the bottom of the outer vessel is carried up to its top, and from this pipe the inlet and outlet pipes branch off below the bottom of the tank. The gas-holder proper floats like an inverted bell on the water contained in the tank. All this part of the construction is the regular gas holder construction as used by gas engineers. From the center of the gas holder bell a cord is carried upward, passing over two pulleys on a simple frame and then hanging down, and from its outer end depends a water vessel. This may be weighted, if necessary, to act as a counterpoise, but its object is primarily to supply the element of safety in providing means for automatically removing water from the carbide.

The evolution apparatus consists of a wide mouthed bottle with tightly fitting cork. Through an aperture in the center of the cork a tightly fitting rod passes which carries at its lower end a basket of wire gauze. In this basket the carbide is placed. A second tube passing tightly through another aperture in the cork leads to the gas holder. If this bottle is half filled with water and the basket is lowered until the carbide touches the water, the gas will at once be evolved with astonishing rapidity and the gas holder will rise. As it reaches approximately the proper height, the wire could be drawn up by hand and the evolution stopped, but to avoid this necessity a connection is made between the vessel suspended from the string of the gas holder bell and the evolution bottle. A hole is drilled through the glass of the bottle about half way up the side and a rubber tube is tightly fitted in this aperture. If the tube does not make a watertight joint, a glass tube can be forced through the rubber one to compress it against the glass of the bottle. From this aperture a rubber tube leads to a nipple in the bottom of the suspended vessel. The effect of this is that as the holder rises the suspended vessel descends and presently begins to receive water from the evolution bottle, so that as the holder reaches its upper limits an inch or more depth of water will be withdrawn, leaving the carbide of calcium above the surface.

The mode of operation is obvious. The bell of the gas holder is placed at its lowest position, the carbide basket is charged with some lumps of carbide, the cork is placed in the bottle and the wire is forced down by hand until the bottom of the basket is a quarter or half an inch beneath the surface of the water. The gas rapidly evolves and the holder rises. If the evolution is too rapid, the basket may be raised. In a few minutes the holder is full and the suspended vessel contains perhaps half the water. Now the basket is lowered until its bottom is about at the water level or perhaps a shade lower. If the holder descends, more water runs into the evolution bottle and gas is produced; if the holder rises, the water leaves the carbide, thus automatically causing the evolution to cease.. An approximately constant level of gas holder is thus maintained with an almost exactly constant pressure.

If it is necessary to replenish the carbide basket, all that is necessary is to close, by means of the spring wire pinch cock, the communication between the gas holder and evolution bottle. If the gas is being burned, this does not interfere with its delivery. After the new material has been introduced the basket can be replaced, and lowered, and all will go on as before. As considerable calcium hydrate accumulates, the water connection is made well up the side of the evolution bottle, to keep the solid material out of the India rubber tube. The bottle may be cleaned out from time to time by shutting off the two spring cocks if necessary, or at any rate the one on the gas evolution tube, leaving the operator free to uncork and to wash out the evolution apparatus. It is well also to give the carbide basket a thorough cleaning between the additions of the carbide.



HOME MADE ACETYLENE GAS PLANT.

The Virtues of Grapes, Oranges, and Pumelos.

Very few people are aware of the medicinal qualities of grapes; but these they possess. The pulp is nutritious and the juice contains sugar, tannic acid, bitartrate of potassium, tartrate of calcium, common salt and sulphate of potassium.

Without doubt, the woman who cultivates the habit of eating a great deal of fruit is the gainer of health and appearance.

The grape fruit, or shaddock, so called from its discoverer, Lieutenant Shaddock, or to mention its soft Chinese name, pumelo, is highly prized by those who live in malarial localities. It is a charming rival to quinine and boneset, and is driving them from the field. She who eats her grape fruit with a spoon from the natural cup, or relishes it served as a salad, may gladden her heart with the reflection that she is not only pleasing her palate, but benefiting her health. Like oranges and lemons, the grape fruit has great medicinal virtues. If you are of a bilious temperament, says a writer in the Washington Times, eat grape fruit; if fevers threaten, eat grape fruit, but in this latter case, adds the writer, do so only at the advice of a physician, as there may be certain tendencies which the grape fruit would only aggravate. The complaint is often made that this fruit is extremely bitter and unpleasant. It is only the white inner rind which is so, and this should be carefully removed.

Embossing Dies Made by Photography.

The writer devised in October, 1881, the following method of etching brass embossing dies, which is now for the first time published. The trouble in photo-engraving brass dies for embossing book covers and other purposes is that the mordant used is so strong, and the depth required so great, that there is difficulty in getting a coating on the relief portions of the die that will protect them absolutely from the attacks of the acid mordant.

Further, the etching is an intaglio one instead of relief. That is, the black lines of the design are sunk in the brass plate, instead of being left in relief as in ordinary photo-engraving. Therefore the process described here can be applied to etching on glass, steel or any other surface wherein an intaglio result is required.

We will suppose that the designer has made his drawing as usual in pen and ink for reduction. An ordinary photo-engraver's negative is made of this drawing in reverse. The brass is first cleaned with a strong solution of potash and then surface-finished with willow charcoal, as in preparing zinc. After washing well under the tap, flow the brass with the following solution: Well-beaten egg albumen, 1 ounce; powdered bichromate of ammonium, 25 grains; aqua ammonia, 5 drops; water, 8 ounces. This solution should be poured on one corner and be allowed to flow off the diagonally opposite corner, and this operation repeated until the solution has drained from each of the four corners. The plate is then dried in a dark room with a gentle heat, while in an almost vertical position.

The brass plate is now sensitive to light and should be exposed under the negative for one minute in sunlight or three or five minutes in the shade. After which it is taken to the dark room, heated slightly, just to remove the chill, and inked evenly and lightly with a glue or leather roller and any kind of printing ink. This last is said intentionally, for the ink is not to become part of the acid-resisting coating as in other processes.

After the brass plate is inked, it is laid for a minute in a tray of clean cold water, and the inked surface rubbed over with a tuft of absorbent cotton. It will found that the ink readily leaves all portions of the brass except where the light has acted through the negative. When the plate has been lightly rubbed over its entire surface with the cotton, the design should show as a positive in black lines of ink with the bared brass as a background. The plate is now dried.

It might be said here that, in the finished dye, the design, now in black ink, must be sunk in the plate, and the problem before us is how to cover the uncovered brass with a coating impervious to acid, and remove the ink design so that the metal underneath it may be attacked by the acid.

This is how it is accomplished: A saturated solution of dragon's blood powder is first made and filtered through cotton. This is flowed on the brass plate containing the inked design and thoroughly dried. Then it is flowed, while in a horizontal position, with spirits of turpentine. This penetrates the dragon's blood coating, so that with a tuft of cotton the ink design can be washed away, leaving a negative image on the brass, which is now ready for etching with nitric or chromic acid, chloride of iron or the other mordants in use. When the "biting" has proceeded to a sufficient depth, the plate can be rolled up with a strong etching ink and dusted with resin as usual.

All etchers will appreciate the value of this process, which enables them to make a relief, or positive, plate from a positive on paper or glass, and a negative, or sunken, design from a negative.—Anthony's Bulletin.

A New Variable Star.

A variable star recently discovered by Mr. Chandler presents some very remarkable features (Astronomical Journal, No. 358). In the singularly short period of 5 h. 31·15 m., the magnitude of the star varies between 8·9 and 9·7, so that three or four of the principal phases may be observed in a single night.

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THE UNITED STATES BATTLE SHIP IOWA.

One of the new battle ships now being constructed at the Cramps' ship yards, the Iowa, is represented in the accompanying illustration. She is one of the most formidable of our war vessels now in course of construction, and the tests of the heavy Harveyized nickel-steel armor with which she will be plated were described and illustrated in the SCIENTIFIC AMERICAN of November 9.

The first keel plate of the Iowa was laid August 5, 1893, and it gives one some idea of the great amount of labor required to build such a vessel when it is estimated by the Bureau of Steam Engineering that she will not be ready for final delivery to the government until about July, 1897. It is expected that the Iowa will be launched in February or March.

The Iowa was designed by the Navy Department to meet the requirements of the naval appropriation bill of July 19, 1892, and her cost was not to exceed $4,000,000. The dimensions are as follows:

Length on load line	360 ft.
Beam extreme	72 ft. 2½ in.
Mean draught	24 ft.
Displacement	11,296 tons.
I. H. P	11,000
Speed, in knots, per hour	16
Coal bunker capacity	2,000 tons.

The main battery consists of four 12-inch breechloading rifles and eight 8-inch breechloading rifles mounted in turrets. The 12-inch gun turrets are armored with solid Harveyized nickel-steel plates of 15 inches thickness, and the 8-inch guns are protected by armor of 8 and 5½ inches in thickness. All this armor is treated by the Harvey process, which gives the plates a casehardened surface, gradually shading off to a soft back.

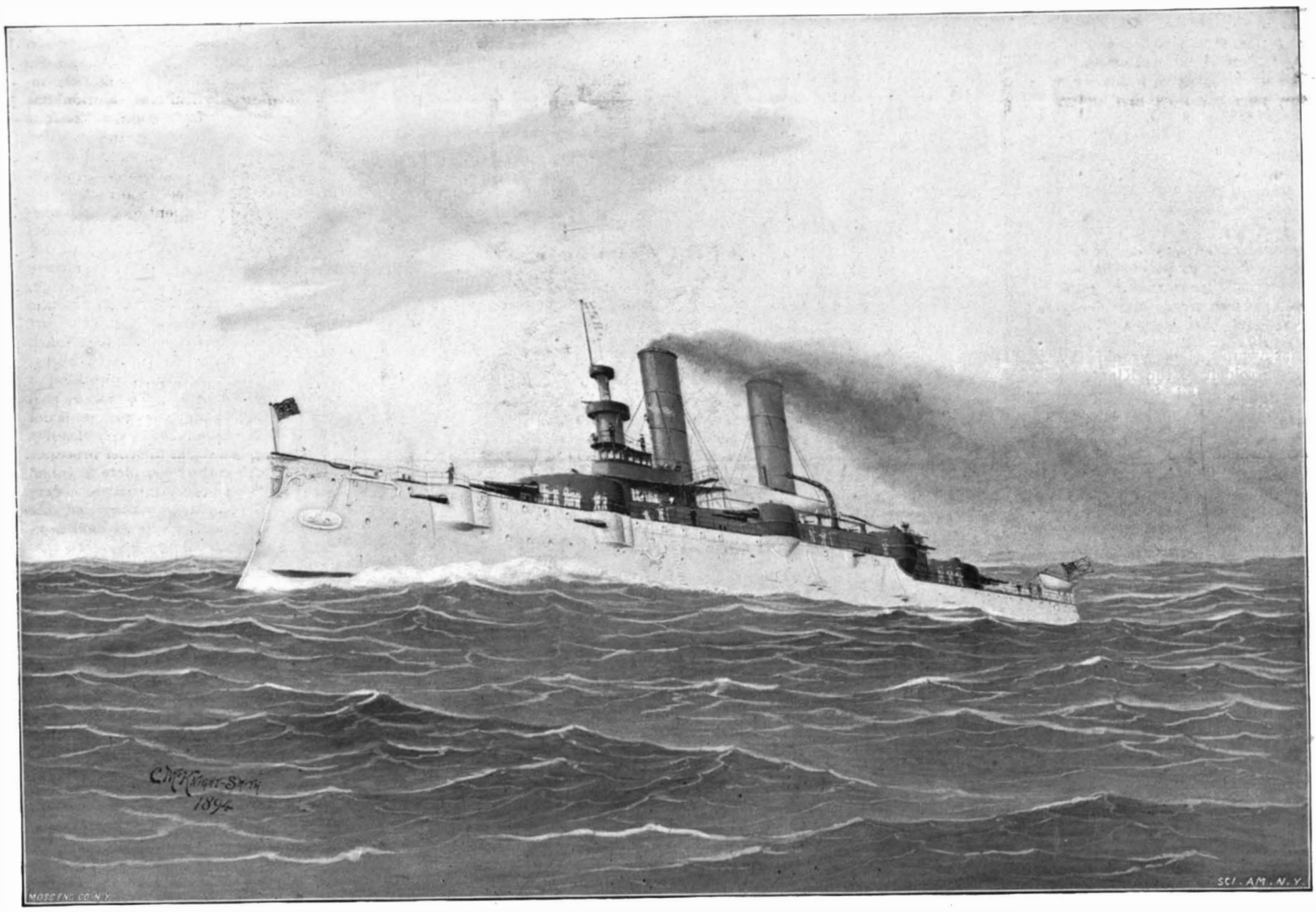
The secondary battery is made up of six 4-inch rapid-fire breechloading rifles. These rifles throw a shell weighing thirty-six pounds, and are capable of being fired ten times per minute. These guns are protected with light armor against machine gun fire, and are disposed so as to have as great a range of fire as possible. The auxiliary battery consists of twenty 6-pounder and nine 1-pounder machine guns, with six torpedo tubes.

The protection to the hull and machinery is afforded by a steel belt of 14 inches maximum thickness, covering over seventy per cent of the load line. This belt extends from 4 feet 6 inches below the load line to 3 feet above it. Above this belt to the main deck bevel between the 12-inch gun turrets, a belt of 4-inch armor is worked to cause shell loaded with high explosives to break up before entering the vessel. On top of the 14-inch armor a horizontal deck 2¾ inches thick is worked, and from the ends of the side armor to the extremities of the vessel a similar deck 3 inches in thickness is provided. Above the armor decks, belts of cellulose to prevent the inrush of water in the event of the vessel being injured are provided. The hull is built on the cellular system, with inner bottom, and great attention has been given to the subdivision of the vessel into a large number of watertight compartments, each provided with its own means of pumping and draining. The machinery and boilers are arranged in six watertight compartments. The engines are of 11,000 horse power, of the inverted, direct-acting, triple expansion type, driving twin screws.

The smoke pipes are in height 100 feet above the grate bars, and the performance of the boilers under natural draught is expected to be a great improvement over boilers in existing naval vessels.

The ventilation and incandescent lighting plants of the vessel have been especially studied, in order to insure comfort and health to all on board.

Electric search lights of great power are provided, capable of lighting up a zone about the vessel through which no torpedo vessel can pass unnoticed, and the machine guns are so disposed as to bear upon all portions of this zone; and should a craft by any means get through this area of light and gun fire, stout torpedo nets reaching from water line to keel are ready to receive the torpedoes discharged.



THE UNITED STATES BATTLE SHIP IOWA.

Use of Cocaine on the Race Track.

Within a recent period cocaine has come into use on the race track, as a stimulant. Horses that are worn and exhausted, or are uncertain as to speed and endurance, are given ten to fifteen grains of cocaine by the needle under the skin at the time of starting, or a few moments before.

The effects are very prominent, and a veritable muscular delirium follows, in which the horse displays unusual speed, and often unexpectedly wins the race. This agitation continues, and the driver has difficulty in "slowing down" the horse after the race is over; not unfrequently the horse will go half round again before he can be stopped. The exhaustion which follows is not marked, except in the great thirst and loss of appetite. Sometimes diarrhea and trembling follow. But good grooms give unusual attention to rubbing and bathing the legs in hot water and stimulants. The general effect on the horse is depression, from which he soon recovers, but it is found essential to give cocaine again to make sure of his speed. The action of cocaine grows more transient as the use increases, and when a long period of scoring follows before the race begins, drivers give a second dose secretly while in the saddle. Sometimes the horse becomes delirious and unmanageable, and leaves the track in a wild frenzy, often killing the driver, or he drops dead on the track from the cocaine, although the cause is unknown to any but the owner and driver. Some horses have been given as high as twenty grains at a time, but this is dangerous and only given to worn-out animals, who may by this means win a race. It appears that cocaine is only used in running races, and as a temporary stimulant for the time. It is claimed that the flashing eyes and trembling excitement of the horse is strong evidence of the use of cocaine.—Quarterly Journal of Inebriety.

The Advantage of Being a Blacksmith.

Among the seven trades which a student in mechanical engineering must learn at Cornell is that of the blacksmith. Occasionally there is a protest, but it is never heeded. One dude ten years ago was unusually averse to soiling his hands. But he had to work at the forge just the same. Last fall he went to Professor Morris and thanked him for being compelled to learn blacksmithing. "Why?" asked the professor. "Why, you see," replied the former dude, "I am now superintendent of a mine away back in Colorado. Last summer our main shaft broke, and there was no one in the mine but myself could weld it. I didn't like the job, but I took off my coat and welded that shaft. It wasn't a pretty job, but she's running now. If I couldn't have done it, I'd have had to pack that shaft on mule back and send it 300 miles over the mountains to be fixed, and the mine would have shut down till it got back. My ability to mend that shaft raised me in the eyes of every man in the mine, and the boss raised my salary."

Water Vapor in the Atmosphere of Mars.

When Professor W. W. Campbell, not long ago, reported that he found no water vapor in the atmosphere of Mars, by careful study, by the aid of the spectroscope at Lick Observatory, astronomers were generally surprised, because that matter was supposed to be settled quite conclusively. Now it turns out that M. Janssen has recently informed the French Academy of Sciences that he has determined the existence of water vapor in the planet Mars by means of the spectroscope.

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THE WHITE ELEPHANT KEDAH.

White elephants have for many years been an object of veneration in Burma and Siam. The fortunate individual who found a white elephant in his possession sold it to the king of one of those countries, obtaining therefor, it is said, certain titles to nobility, exemption from taxation and from capital punishment and a sum of money determined, it is said, in some cases, as the amount of silver coin which he could push along a smooth surface with his little finger. The largest sum ever obtained, it is said, was won by a Chinaman, who assiduously practiced pushing weights, strengthening his hand so as to be able to push along the largest amount of silver possible. Some years ago a partially white elephant was in the Barnum & Bailey show, which animal perished in the Bridgeport fire. There has been recently imported into this city, by the firm of De Silva & Gaylord, a perfect example of the white elephant, an illustration of which we present to our readers.

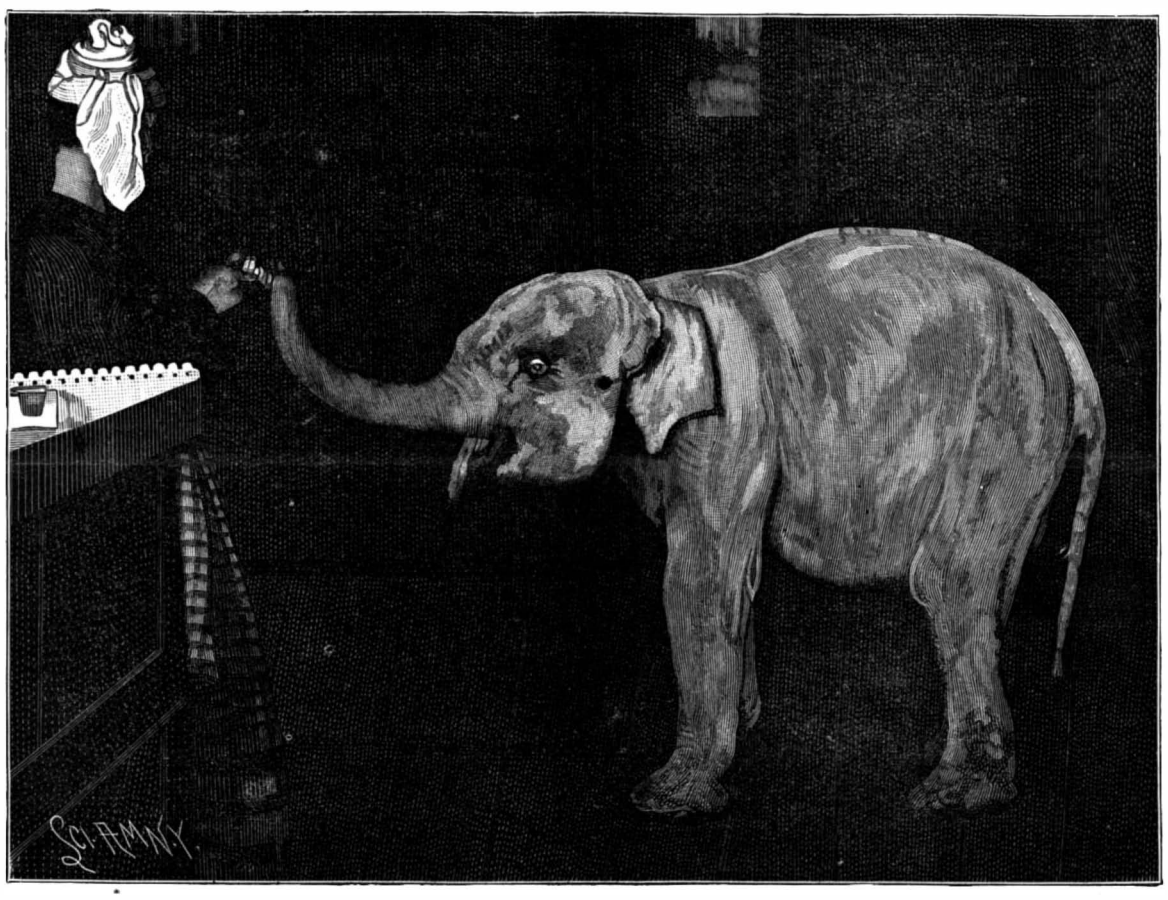
The sacred beast is recognized by certain signs. In addition to the light color of his skin, he was required to have five white hoofs on each foot, he had to show a pink color about the ears, and the hair about the lip was required to be light in color, and the tail to have no tuft of hair upon its end. All these characteristics are shown by the example we illustrate, from a photograph taken by our artist in this city.

The animal was caught wild near Palembang, in Southeastern Sumatra, on June 17, 1895, and is supposed to be about eighteen months old. Its height is three feet nine inches and it weighs about five hundred pounds. The little creature is perfectly docile and content in its captivity and allows itself to be fondled and played with at liberty. It has been named Kedah. In Sumatra the value of the white elephant is not generally known, and the captors of this animal were not aware that they could have sold it to the King of Siam. Had it been found by those having knowledge of this fact, it would probably never have left the East. It is really the only elephant which truthfully can be called white ever brought to this country. Europe has never possessed one of any kind.

White elephants are now only to be seen within the inclosure of the King's palace at Bangkok, Siam. There are four there now, which animals, owing to the peculiar religious tenets of the Buddhists' faith, are absolutely unpurchasable. The doctrine of the transmigration of souls teaches that these animals are inhabited by the souls of Siamese kings.

The white elephant which was with the Barnum & Bailey show was procured with great difficulty by Mr. Gaylord, in Burma. The present animal of the Sumatran variety, an absolutely perfect example of the elephant albino, is one of the most interesting and curious zoological specimens ever brought to this country. The color is a very light gray, and the skin is peculiarly soft and delicate. About the end of the trunk and about the ears it runs into a light pink tint, and the hoofs are a beautiful cream white. The animal is a male, and is expected to attain a height of seven to eight feet.

Its importer, Mr. J. B. Gaylord, has spent many years in collecting animals for exhibition, having in the course of his experience gone twenty-two times around the globe. He brought Kedah home by sea through the Suez Canal, the journey taking fifty days. Kedah arrived rather thin and worn after its trip, but is now in prime condition and bids fair to attain a good old age.



THE WHITE ELEPHANT KEDAH.

Good Advice to Young Women.

In a recent sermon to young women, the Rev. Dr. Talmage made the following sensible remarks:

"Make it a matter of religion to take care of your physical health. I do not wonder that the Greeks deified health and hailed Hygeia as a goddess. I rejoice that there have been so many modes of maintaining and restoring young womanly health invented in our time. They may have been known a long time back, but they have been popularized in our day—lawn tennis, croquet and golf, and the bicycle. It always seemed strange and inscrutable that our human race should be so slow of locomotion, when creatures of less importance have powers of velocity, wing of bird or foot of antelope, leaving us far behind, and while it seems so important that we be in many places in a short while, we were weighed down with incapacities, and most men if they run a mile are exhausted or dead from exhaustion. It was left until the last decade of the nineteenth century to give the speed which we see whirling through all our cities and along the country roads, and with that speed comes health. The women of the next decade will be healthier than at any time since the world was created, while the invalidism which has so often characterized womanhood will pass over to manhood, which, by its posture on the wheel, is coming to curved spine and cramped chest, and a deformity from which another fifty years will not have power to make rescue. Young man, sit up straight when you ride. Darwin says the human race is descended from the monkey, but the bicycle will turn a hundred thousand men of the present generation in physical condition from man to monkey. For good womanhood, I thank God that this mode of recreation has been invented. Use it wisely, modestly, Christianly. No good woman needs to be told what attire is proper and what behavior is right. If anything be doubtful, reject it. A hoydenish, boisterous, masculine woman is the detestation of all, and every revolution of the wheel she rides is toward depreciation and downfall. Take care of your health, O woman; of your nerves, in not reading the trash which makes up ninety-nine out of one hundred novels, or by eating too many cornucopias of confectionery. Take care of your eyes by not reading at hours when you ought to be sleeping. Take care of your ears by stopping them against the tides of gossip that surge through every neighborhood.

"Health! Only those know its value who have lost it. The earth is girdled with pain, and a vast proportion of it is the price paid for early recklessness. I close this, though, with the salutation in Macbeth:

"'Now good digestion wait on appetite,
And health on both.'"

New Material for Spools.

Apropos of an article in a recent issue of the SCIENTIFIC AMERICAN in regard to the thread spool industry, Mr. T. E. Kennedy, of Centerville, Louisiana, writes that there is a wood growing plentifully in that State which is peculiarly adapted to the manufacture of spools. The wood is known as tupelo gum. It does not split or check; it is light and a very fine uniform grain. It is not adapted to uses where it is to be made into objects of any size, as it is liable to warp. It will not readily burn, and is not durable when exposed to the elements.

IN our article describing the Lovell adjustable handle bar, in the SCIENTIFIC AMERICAN of December 28, Fig. 2 of the illustrations, representing the bar as in use by a fast rider or racer, was referred to as No. 5. The latter in reality is an enlarged view of Fig. 2 and shows the mode of adjustment.

Millions for Chicago University.

Chicago University was on December 14 the recipient of another million dollar gift, the donor being Miss Helen Culver, of Chicago. The conditions of the gift are that it shall be devoted to the increase and spread of knowledge within the field of biological science.

It is provided that the donation shall develop the work now represented in the several biological departments of the university by the extension of their resources; that it shall be applied in part to an inland experimental station and to a marine biological laboratory, and that a portion of the instruction supported by the gift shall take the form of university extension lectures to be delivered at suitable points on the west side of Chicago, the lectures to be as free from technicalities as possible and the results of biological research. Especial attention is to be devoted to the advances of science in sanitation and hygiene.

One-half of the sum given may be used for the purpose of purchasing land and for the erection and equipment of buildings. The remainder is to be invested, the income therefrom constituting a fund for the support of research, instruction and publication.

According to the terms of Mr. Rockefeller's recent offer, he will also now add another million dollars to his former generous gifts.

Prevention of Influenza.

Dr. C. Graeser, of the German Hospital at Naples, points out* that the timely and continuous administration of quinine during influenza epidemics may undoubtedly prevent infection, and cites in support of this opinion—in holding which he does not stand alone—his experiences with regard to a regiment of huzzars stationed at Bonn during the epidemic wave of 1889-90. He has previously published these facts, but again refers to them in consequence of an article which appeared this year in Paris medical journal, stating that experiments on rabbits showed quinine to be inactive against the infection of influenza. His facts are simply these: that for a period of twenty-two days he administered to each man of one of the squadrons of the regiment 0·5 gramme—i. e., about 8 grains—of quinine hydrochlorate, and that the numbers attacked by influenza in this squadron were far smaller than those who succumbed in each of the other squadrons, even in those occupying the same quarters. Thus, during this period there were attacked in the first squadron twenty-two men, in the second seven, in the third nineteen, in the fourth forty-two, and in the fifth thirty-two. Now it was the second squadron that underwent the quinine treatment, and of the seven men attacked three fell ill on the first day of the trial, two on the third day, and one on the fourth and fifth days respectively. After that no cases arose in this squadron, although fresh attacks continued to occur in other detachments. Dr. Graeser is persuaded that this experimentum crucis justifies the conclusion that quinine has a specific action in influenza, and that when administered at the appropriate time and in sufficient dose it may prevent an attack in a person exposed to infection. Such an experience, he holds, is of more weight than any experimental results in animals.

Atomic Weight of Helium.

By heating in a hard glass tube a mixture of manganese carbonate, pulverized cleveite, and potassium pyrosulphate, and passing the resulting gas over hot copper oxide, phosphorus pentoxide, and powdered magnesium, N. A. Langlet has succeeded in obtaining helium perfectly free from nitrogen, argon, and hydrogen, when tested spectroscopically. This gas, when weighed in the usual manner, proves to be exactly twice as heavy as hydrogen, the usual standard, its density in relation to air being 0·139. Guided by purely physical considerations, the experimenter arrived at the conclusion that the molecule of helium, like that of argon and of mercury, contains only one atom. Hence the atomic weight must be taken as 4.

*Wiener Klinische Rundschau, 1895, No. 45.
†Revue de Medecine, 1895, No. 3.

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Protecting the Hands in Photographic Manipulations.

The British Journal of Photography says: Metol seems to be gaining, rightly or wrongly, an unenviable character for the injurious action it is said to exercise on the hands of its users. But, be it ever so hurtful, is there any reason why it should be allowed to exert its ill effects? In the development of negatives, only the extreme tips of the forefingers and thumbs need be wet with the solution, and then only the front portion of them, where the skin is the thickest. In most instances, in handling injurious chemicals, it is only when they come in contact with the thinner portions of the skin—as on the back or between the fingers—that any harm results. However, India rubber finger stalls, costing but a few pence each, are to be had at all rubber shops, that will perfectly protect the fingers from all pernicious materials. They are much more extensively used by photographers, both professional and amateur, on the Continent that they are here. Being exceedingly thin, they are by no means uncomfortable to work in. It is curious to note the effect that different chemicals have on different persons.

An Artificial Ice Rink.

A new skating rink at One Hundred and Seventh Street and Lexington Avenue, New York City, was opened December 14.

The interior of the new palace is dazzling. Ceiling and walls are hung with artificial icicles, illuminated by 2,000 electric lamps of various colors. There are two galleries, large enough to seat 5,000 spectators. Eighteen hundred persons can find room on the ice surface at one time.

The pond is frozen artificially, the cold being produced through the evaporation of anhydrous ammonia in coils of hollow copper tubes. The heat is abstracted from a brine solution surrounding these coils, the freezing point of which solution is lower than that of the water in the skating pond. Long rows of tubes filled with this frigid brine and communicating with the freezing apparatus lie below the surface of the ice and prevent its softening.

THE PUNNETT COMPANION SIDE SEATED BICYCLE.

The bicycle has now reached a typical construction from which there seems to be slight tendency to deviate. Absolute novelties beyond the details are more and more rare. The companion side seated bicycle which we represent is, however, one of the novelties of the year. The tandem bicycle, which has met with considerable success where the desire is to have company on a ride, is more or less criticised on account of the position of the riders, one of whom must be behind the other. In the bicycle which we illustrate it is proposed to have the two riders seated side by side, as in the old-fashioned "sociable" tricycle, and yet to have the two riders carried by two wheels only. The two cuts are self-explanatory. The long axle of the rear wheel enables the use of two sprockets at its extremities so far apart as to permit of each one being acted upon through a separate pair of sprockets, each actuated by a separate rider. There is a triple head and a duplex frame, the latter carrying two saddles placed side by side at a proper distance apart for two riders to occupy also side by side.

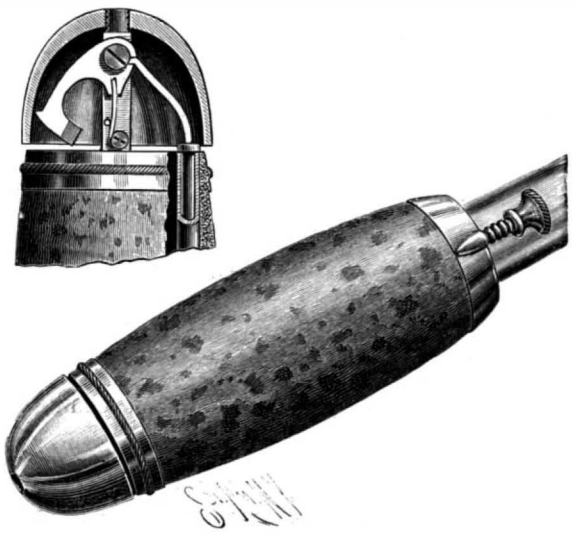
It is said that a difference of 100 pounds weight in the two riders is not noticeable, and that a person who is ignorant of riding can be taken out on this wheel with perfect safety. The system of mounting is peculiar. For the first one who mounts, the wheel is inclined to one side and this rider takes his or her place on the lowe saddle. The machine is then pulled back to an upright position and the second rider mounts by the pedal, and so the start is made. The dismount is made in the same way, reversing, of course, the operations. The two saddle posts are connected, it will be observed, by a crossbar. At the center of the crossbar is a special socket. When a single person is riding the wheel the saddle is transferred to the central position and the rider sitting there drives the machine by one of the right hand and one of the left hand sets of pedals. This, of course, produces considerable lost motion in the pedal action, but it at least is possible for a single rider to take care of and to drive the wheel to and from the place of appointment with his friend. It is not a wheel depending absolutely on the presence of two riders. The wheel shown in the illustrations is made by the Punnett Cycle Mfg. Co., Rochester, N. Y.

BICYCLE FOR TWO.

A HANDLE BAR BICYCLE BELL.

The illustration represents a bicycle bell attached to the outer end of one of the handles, without disfiguring it or offering any impediment to the free use of the handle bar, while it affords sufficient volume of sound for practical purposes. The improvement has been patented by I. N. Hopkins, of Lockport, N. Y., and is being introduced by the Bridgeport Gun Implement Company, of Bridgeport, Conn., and Nos. 313 and 315 Broadway, New York. It comprises a combined handle and alarm bell which may be placed on the handle bar instead of one of the ordinary handles, the bell being operated by the thumb of one hand. Secured to the outer end of the handle is a plate with projecting central post whose outer end supports the bell, whose external form is such as to conform to the curvature of the handle, the rim of the bell being near but not in contact with the handle.

On a lug on the post is a stud on which is pivoted the hub of a spring-pressed bell hammer, and a projecting tooth on the hub is engaged by a curved spring rod, forming an extension of a push rod extended through a tubular casing in one side of the handle and terminating in a thumb piece. By pressure upon the thumb piece the hammer is forced back against the resistance of its spring, and released to deliver its blow, the push rod being returned to its normal position by a coiled spring. This improved device is made to fit various sizes of handle bars.



A SIMPLE AND CONVENIENT BICYCLE BELL.

Do People Ever Forget Anything?

The brain of mankind has been defined as a kind of phonographic cylinder, which retains impressions made upon it through the medium of the senses, particularly through the eyes and ears. If this be true, memory must depend for its intensity or retentive qualities upon the degree of observation with which the record is made.

Nor is this all. If memory's record is kept in the shape of indentations upon the folds of the brain matter, are they ever entirely effaced? In other words, do we really ever forget anything? May it not be that the inner depths of the brain memory have stored up recollections of things which are never again purposely turned to, perhaps, but which instantly spring into being and flash through the mind whenever we hear or see something which recalls them?

There are several well known mental phenomena which strengthen this theory. We know that memory often brightens during the last moments of life, and there are cases on record where Germans, French, Spaniards and others, who, falling ill in this country years after having entirely forgotten their native languages, recovered and used them upon their death beds.

There is a theory that in all such cases the brain folds have relaxed, just as do the muscles and cords of the limbs and body, and that by so doing they expose the mind's monitor indentations (recollections), which were long since folded up and put away as material that could not be of any particular use.—Family Doctor.

Dehydrating Alcohol.

Recommended by H. Wislicenus and L. Kaufmann. The reagent used is amalgamated aluminum, which can be prepared in a few moments by treating aluminum filings, free from oil, with caustic soda solution until a brisk evolution of hydrogen is produced, then washing once superficially with water and allowing a half per cent solution of corrosive subimate to act for one or two minutes upon the metal, which is still moist with weak alkali solution. The whole operation is rapidly repeated to remove a black scum which forms, and the product is quickly and thoroughly washed with water, alcohol and ether in succession, and is preserved, if necessary, under low boiling petroleum ether. Aluminum filings are on the market, at least in Germany, at a reasonable price. The amalgamation of this metal changes its chemical properties in a remarkable manner, so that it decomposes water violently, and it even becomes hot spontaneously from the action of the moisture of the air, with formation of white flakes of aluminum hydroxide. The reagent has no action upon alcohol and ether, but it reacts promptly with any water contained in them. The authors especially recommend the substance for use in organic chemistry as an entirely neutral reducing agent.—Berichte deutsch. chem. Ges., xxviii, 1323, June, 1895; H. L. W., Amer. Jour.

The Simplon Tunnel.

The convention between Italy and Switzerland for the construction of the Simplon Tunnel was signed a few days ago. The programme of works to be followed is that already begun by the Jura-Simplon Company, the Swiss Federal Council, and the Italian Government. Italy undertakes to construct approach lines from Domodossola to Isella, a distance of 10½ miles. The Italian Government itself does not grant any subvention, but will use its influence to induce the provinces and towns of northern Italy interested in the scheme to provide a sum of 4,000,000 francs. Italy will, however, grant for 99 years an annuity of 3,000 francs per kilometer for the portion of line in Italian territory, which is calculated to be equivalent to a capital sum of 1,500,000 francs. Switzerland will have to provide a subvention of 15,000,000 francs, of which 4,500,000 francs will be found by the Confederation and 10,500,000 francs by the cantons and towns interested.

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RECENTLY PATENTED INVENTIONS.

Engineering.

FIRE BOX FOR BOILERS.—Edward Ingleton, Pottstown, Pa. This fire box has a horizontal water leg at each side at the bottom and a single water leg in the middle at the top, with two separate series of water tubes, each series on one side and extending from the lower to the upper water leg, the tubes being close together and constituting a flame-tight tubular box which is conveniently detachable from the boiler for cleaning and repairs. This fire box is so connected with the interior of the boiler that a perfect circulation is obtained. The improvement is especially designed for locomotives and traction engines.

Railway Appliances.

SWITCH WORKING MECHANISM.—Robert W. Farrell, Vincennes, Ind. Connected with the rails, according to this improvement, is a spring barrel with spring-pressed piston rod pivotally connected with a switch stand, a dog on the barrel engaging a shoulder on the piston rod, while a connecting lever extending parallel with the track is moved by striking arms on the track to trip a lever to tilt the dog. The improvement may be used in connection with an ordinary switch, the tripping devices being then actuated by a passing train or engine to automatically close a switch.

STREET RAILWAY CAR.—Willard R. Dodson, Jermyn, Pa. This is a car designed to be readily transformed from a winter to a summer car. The car has removable sides, which are provided with guides receiving the windows of the winter car, so that the windows may be moved into auxiliary guides and the whole disconnected from the car. Different sets of seats are also provided, the change being readily made from one to the other.

Electrical.

HOLDER FOR TELEPHONE RECEIVERS.—Fergus W. Martland, Fall River, Mass. This holder is designed to support the receiver close to the ear of the user, without making it necessary to hold the receiver in one hand. A spring-pressed sliding rod is connected with the telephone switch and an arm pivotally connected with the rod carries the receiver, a segment holding the arm in any desired inclined position to bring the receiver close to the ear of the user.

RENOVATING STORAGE BATTERIES.—John Trowbridge, Cambridge, Mass. This inventor has devised a method of renovating lead accumulators by removing temporarily the negative elements after the battery has been charged, replacing them by amalgamated zinc plates, then discharging the battery, removing the zinc plates and returning the lead negative element to the battery while it is recharged; the negative elements are then again removed and the zinc plates inserted and the battery discharged, the process being repeated until the battery has been restored to its normal efficiency.

Mining.

ORE CRUSHER.—August H. Schierholz, San Francisco, Cal. This is a strong and simply constructed machine to facilitate the crushing, pulverizing, and amalgamation of ores, and comprises a pan in which the crushing rollers are adapted to travel, the rollers being journaled in a frame, while a driving arm engages blocks held vertically adjustable on the frame to permit the rollers to move up or down according to the material under treatment.

Mechanical.

MACHINE FOR TREATING METAL RODS.—John Doughty, Philadelphia, Pa. This machine comprises frames with racks adapted to move in opposite directions, the racks receiving between them a bundle of rods to be treated, means for imparting a reciprocating motion to the racks, end plates engaging the ends of the rods, and a feed table extending between the racks. The machine is designed to facilitate the rapid tempering, cleaning and straightening of the rods.

FLOAT VALVE.—Joseph W. Chamberlain, Bangor, Me. This valve is designed to open and close a full waterway instantly, affording a flow of water as large as the pipe supplying the valve will discharge, while the construction is simple and inexpensive. The valve is more especially designed for use in connection with a house tank, where the ordinary float valves open but a small passage for the water if only a small amount is drawn from the tank.

Agricultural.

CULTIVATOR.—Charles E. Booi, Danforth, Ill. This is a machine designed to be drawn by three horses, and it is provided with equalizing devices whereby the strain on the team is reduced to a minimum, the draught being taken from the rear portion of the machine, and the side draught not being sustained by the team, nor the harness injuring the animals. All the cultivator blades may be readily raised from the ground, and the machine made to travel on supporting wheels, one at each side. The machine also comprises a gopher cultivator of simple and inexpensive construction and thoroughly under the control of the operator.

LABELING PLANTS, ETC.—Frederick R. and Clara J. Chapman, Dunedin, New Zealand. This invention provides a convenient movable and readily adjustable label standard, which will present the labels directly to the observer at any desired angle, and provides also a special form of label. The label holder consists of a standard and a double hook formed of a wire whose middle portion is bent or twisted about the head of the standard, and the label is composed of a plate having a brace which diverges at an angle, the free end engaging the body of the standard or carrier.

Miscellaneous.

CALENDAR CLOCK.—Alfred E. McCollum, West Leisenring, Pa. This invention relates to calendars attached to and driven from watches or clocks, and consists principally of a rotatable sleeve carrying the month hand, a shaft rotating in the sleeve being driven from the clockwork, and there being on the shaft a double hand, the hands standing at angles, and one indicating the day of the month and the other the day of the week. The positions of the hands are adjusted monthly.

AUTOMATIC DISINFECTING DEVICE.—Emil Taussig and Michael Sheridan, New York City. This is an improvement for toilet rooms, comprising a water-holding reservoir controlled by a float valve, and a rocking liquid holder for disinfecting fluid that is tilted for the discharge of a gaged amount by draught strain of a flexible connection, a siphon-controlled water-discharging device being set to work by the tilting movement of the liquid holder when it is rocked.

HYDRAULIC AIR COMPRESSOR.—Albrecht Kalthoff, New York City. This is an improvement more especially designed for use in beer pumps and similar machines, the compressor being simple in construction and not liable to get out of repair, automatic in operation and utilizing the pressure of the water to the best advantage. A spring-pressed main valve controls the inflow and outflow of the water to and from the compression cylinder, and the valve has a hollow stem forming an air inlet and a leakage water discharge, a spring-pressed valve engaged by the stem connecting it with the general water discharge.

SPLICING SCISSORS.—John A. Myers, Monroe City, Ind. Each blade of these scissors is provided with a side perforation, one of the perforations being adapted to receive the end of a strip to be spliced and the other being circular, for use in splicing cords. One of the blades also has an additional cutting edge near its point. The improved device forms a combination tool which may be advantageously employed for various household uses.

BOILING EGGS.—George Fundinger and Ulderico Nessi, New Brighton, N. Y. To accurately and automatically regulate the time of boiling eggs, that they may be as hard or as soft as desired, these inventors have devised an apparatus in which a clock mechanism is connected with an egg receptacle, with means for submerging the eggs and raising them out of the water at the end of a certain time, the time required for boiling being regulated by moving an adjusting lever on an index with scale of minutes and fractions.

CHERRY STONER.—Emil Zeitfuchs, Portland, Oregon. To remove the pit from the fruit without mashing or injuring the cherry, this inventor provides a device in which a suitable base forms an open bottomed seat for the fruit, while attached to the base is a spring wire guide and spring for a plunger adapted to be pressed down by a thumb piece to press the pit through the stem opening of the fruit.

DISH CLEANER.—Albert J. Finlay and Charles Wilson, Silverton, Oregon. According to this improvement a receptacle for hot water or a cleansing compound, adapted to be kept heated on a stove, has an inner basket in which dishes may be placed, the basket being raised and lowered by turning a crank supported in standards at the sides, the water being forced up around the dishes on the downward motion of the basket, and draining off on its upward movement.

CLOTHES LINE PULLEY.—Johan J. Leuzinger, West New Brighton, N. Y. This is a pulley which automatically adapts itself to the expansion and contraction of the line, and the clothes pins on the line may be readily passed around the pulley without being forced from the line or from clamping engagement with the clothes. The pulley has a hub and radiating wings, the outer face of the pulley between the wings being concaved, and each wing having a recess and depression in its bottom wall.

CHAIR ATTACHMENT FOR SEWING MACHINES.—Jane A. Adkins, Atlanta, Ga. The curved forward legs of this chair are made in pivotally connected sections, whose forward extremities are adapted for attachment to a sewing machine frame, and the rear legs and back are hinged to the seat. When not required for use, the chair may be so folded as to occupy but little room and disposed of beneath the table of the machine or within its cabinet work.

REMOVING GARBAGE.—Wolfgang Goetz, New York City. An apparatus for this work designed by this inventor consists principally of a wheeled wagon body having at its top a receiving spout closed by a slide, a gate at the rear being held in an open or partly open position. A box seated on the wagon spout has drop bottom doors, the box having a cover of which part is fixed and part hinged, the apparatus being designed to facilitate the removal of garbage without scattering portions in the street, and spreading disagreeable odors

WINDOW.—William Wallace, New York City. This inventor provides a window arranged to permit of readily cleaning the window panes on both sides from the inside of the room, the two sashes being readily swung downwardly and inwardly into an open position. A bar hinged to the lower rail of the upper sash has on its lower side a flange to enter a recess in the top rail of the lower sash, while a slotted arm or hasp pivoted to the free end of the hinged bar swings down to receive a knob or turn button in latches mounted in the top rail of the lower sash.

GATE.—Abner Yates, Yates Center, Kansas. This is a gate which may be opened by those on horseback or in vehicles, the levers engaging the latch bar when the gate is closed being adapted to be operated by the wheel of a vehicle, or by the pressure of the hand or foot of a person seated therein, or on horseback. The improvement is designed to be durable and inexpensive, and the construction is very simple.

LATCH.—Nestor Lattard, New York City. This is a simple and inexpensive latch lock which may be applied to the leaves of a table without affecting the even upper face of the leaves. The casing has a top plate and side plate, the latter having an opening to receive a keeper, and the latch bar has a head at one end and a handle at the opposite end, a spring normally holding the latch head transversely of the keeper receiving opening.

MATCH BOX.—Isaac O. Day, Ottumwa, Iowa. This box has in its top a vertically sliding carrier plate operating a rocking match-carrying plate to project it through an opening in the top of the box. At each operation of the mechanism of the box, by the pressing of a thumb piece, a single match is expelled and simultaneously ignited, being held upright on the box when lighted.

Designs.

HANDLE FOR SPOONS.—Austin F. Jackson, Taunton, Mass. Scroll, fluted and ball ornamentation on the front of the broad portion of the spoon handle, and flowers and foliage on its back, are the leading features of this design.

BRACKET.—De Witt C. Bowen, Kansas City, Mo. This bracket has an upright member and two curved members, the whole somewhat resembling a letter K.

GLASS DISHES.—Henry T. Broden, Brooklyn, N. Y. Three designs have been patented by this inventor for glass dishes, such as bowls, plates and jugs, all of the designs having prisms crossing one another at different angles, and forming prismatic and multiple pointed stars and oval and polygonal panels.

ABDOMINAL SUPPORTERS.—John H. Kellogg, Battle Creek, Mich. This is a supporter pad having side pear shaped perforated plates connected by a webbing.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

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SCIENTIFIC AMERICAN BUILDING EDITION.

DECEMBER, 1895.—(No. 122.)

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1. Elegant plate in colors showing a residence in the Colonial style recently erected at East Orange, N. J., at a cost complete of $11,000. Three perspective elevations and floor plans, also an interior view. An excellent design well treated. S. W. Whittemore, architect, East Orange, N. J.
2. A Colonial house at Madison, N. J. Perspective elevation and floor plans. Cost complete $5,500. Architects, Messrs. Child & De Goll, New York City.
3. A Colonial dwelling at Montclair, N. J. Two perspective elevations and floor plans. Architect, W. E. Bloodgood, New York City. A unique design.
4. Two perspective elevations and floor plans of a house recently erected at Brick Church, N. J., at a cost of $2,700 complete. A pleasing design. Architect, Mr. F. R. Hassman, Orange, N. J.
5. View of the new City Hall, Philadelphia, which has been erected at a cost of over $20,000,000. The building is of white marble and covers four and a half acres. Is absolutely fireproof. The height of this building is 547 feet 3½ inches, being, with two exceptions, the highest building on the earth. The exceptions being the Washington Monument and the Eiffel Tower. The next highest building on earth is the Cologne Cathedral, which is 510 feet.
6. View of the facade of the magnificent new Boston Public Library, Boston. Architects, Messrs. McKim, Mead & White, New York City.
7. Residence at Bensonhurst-by-the-Sea, L. I. Two perspective elevations and floor plans. Cost complete, $8,500. Architect, S. S. Covert, New York City.
8. Perspective elevations and floor plans of a cottage at Oakwood, S. I., recently erected at a cost of $2,800 complete. An attractive design.
9. Miscellaneous Contents: Testing house pipes and drains.—A combination bathtub and washstand, illustrated.—The permanence of modern dwellings and public works.—An improved steam and hot water heater, illustrated.—Moving a large factory.—How to fix paper on drawing boards.—A quick water heater, illustrated.—Improved toilet room fixtures, illustrated.—A single track parlor door hanger, illustrated.—An improved furnace grate, illustrated.—Cements in mason work.—An improved furnace, illustrated.—A regenerative gas heater, illustrated.—Improved woodworking machinery, illustrated.

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Notes & Queries

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

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Minerals sent for examination should be distinctly marked or labeled.

(6686) H. J. H. asks how to make aromatic sulphuric acid. A. Sulphuric acid, 3½ fl. oz.; alcohol, 30 fl. oz.; mix. Add 1½ oz. powdered cinnamon; powdered ginger, 1 oz.; digest for six days and filter.

(6687) H. N. says: Please inform me how to get rid of red ants; their stronghold seems to be in stone foundation of the building? A. 1. Powdered borax sprinkled about the infested places will exterminate both red and black ants. Powdered cloves is said to drive them away. Another plan is to grease a plate with lard, and set it where these insects abound. They prefer lard to anything else, and will forsake sugar for it. Place a few sticks around the plate for the ants to climb up on. Occasionally turn the plate bottom up over the fire, and the ants will fall in with the melted lard. 2. Use a small amount of oil of turpentine, run into the cracks with an ordinary sewing machine oil can.

(6688) E. Le Q. says: You would oblige me very much if you would state whether coal tar applied (just under boiling point) is a good substitute for paint for a new shingle roof? A. For a fair substitute for paint, take coal tar and lime (burnt, but not slaked), and boil them together in the proportion of 15 lb. lime to 100 lb. tar. Put it on hot. To pulverize the lime, sprinkle it with a little water and sift it. To avoid the tar boiling over, stir the lime in the boiling tar very slowly. The mixture must always be heated before putting on.

(6689) R. D. C. asks: What causes the lunar rainbow, visible at night in the Southwestern States, especially in New Mexico? It is visible on a clear, cloudless night, the moon not being visible. A. Lunar halos, coronas and rainbows, like those of solar origin, are produced by the reflection and refraction of the light of the moon in the condensing moisture in the air, which at the moment of formation of the halo or rainbow has become vesicular or converted into minute globules of water. This is observable in the daytime by a haziness of the atmosphere, but at night, owing to the darkness, the sky may appear cloudless and yet be overcast with the haze necessary for producing a rainbow or halo. The principles of refraction and reflection involved in this phenomenon are described and illustrated in works on meteorology and natural philosophy. The statement that the moon is invisible is not sufficient; the inference is that it may have been just below the horizon or partially hidden by clouds on the horizon.

(6690) L. M. G. asks: What is the highest average speed ever maintained by a train between London, England, and Aberdeen, Scotland, deducting stops? A. 540 miles in 512 minutes, or at the rate of 63¼ miles per hour continuous run. 2. What is the distance between said points by the road the feat was accomplished on? A. Five hundred and forty miles by railway from London to Edinburgh, via West Coast route. 3. What is the English record for long distance travel, time and points? A. On short runs, the greatest speed was 75 miles per hour. 4. What is the American record for long distance travel? A. 199 miles in 174 minutes, on D., L. & W. RR.; 147.84 miles in 130 minutes, 68¼ miles per hour, N. Y. C. & H. R. RR.; 510 miles in 470½ minutes, 65 miles per hour, L. S. & M. S. RR. 5. On what road is the fastest regular train in the world run? A. The highest average speed for a 100 mile run is 72 miles per hour, and for the entire run between New York and Buffalo on N. Y. C. & H. R. RR., 64¼ miles per hour. The N. Y. C. & H. R. RR. probably lead in the fastest regular train service. See SCIENTIFIC AMERICAN, August 31, September 21, October 19, 26, November 2, 1895, for interesting details of high speed on railroads.

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Switch operating and signal apparatus, electrical, J. Dutrey 552,053
Syringe, W. H. Knap 551,973
Table. See Ironing table.
Tag machine, Weinman & Eucherhofer 551,878
Tea or coffee pot or other vessel, E. B. Manning 551,933
Telegraph, electric, W. H. Cooley 551,947, 551,948
Temperature regulating apparatus, automatic, C. L. Fortier 551,951
Tent, J. B. Long 551,977
Thermostatic regulating device, C. A. Hale 551,959
Thill coupling, J. Henretty 551,894
Thrasher, bean, G. W. Stevenson 551,911
Tire shield, pneumatic, J. M. Gaston 551,953
Tire tightener, E. Gorsuch 551,956
Tobacco, machine for compressing and binding or cording, J. M. Robertson 551,838
Toe clip, F. K. Hesse 552,086
Toy, E. E. Brown 551,945
Trap. See Sewer trap. Steam trap.
Trip sling, J. W. Provan 551,836
Trolley, pedo electric, R. T. Oney 551,996
Truck, C. B. Merritt 551,983
Truck, car, D. F. Henry 551,963
Truck, railway car, J. C. Eckert 552,054
Trunk, F. I. Leonard 551,975
Tube. See Armored tube.
Tube attachment for lines, metal, F. P. Benedict 551,844
Tubes, making armored or compound, E. T. Greenfield 552,059
Turret machine, J. L. Bogert 551,84
Type writing machine, G. B. Webb 551,842
Umbrella, folding, F. G. Grove 551,257
Valve and steam trap, combined reducing, W. B. Mason 551,778
Valve operating mechanism for lavatory vessels, J. W. Hale 551,861
Valve, pressure reducing, E. P. Holly 551,966
Valve, rotary cut off, Hemelright & Taylor 551,961
Valve, steam actuated, G. H. Williams 552,081
Vapor burner, E. I. Nichols 551,833
Vehicle running gear, S. M. Caborn 551,886
Vehicle strap holder, J. M. Diffendafer 552,050
Ventilator for greenhouses or other structures, F. C. Chadborn 551,889
Vessel, Wycherley & Barlow 551,843
Vise or clamp for rods or pipes, R. J. Lockhart 551,976
Warming appliance, invalid, J. C. Weber 551,939
Washing machine, C. Downing 551,813
Washing machine, A. Webber 551,915
Watch case spring, B. Murphy 552,069
Water closet flushing apparatus, H. Thomson 552,015
Water cooler, J. W. Hale 551,860
Water motor, O. Bryant 551,754
Wedge-locking and unlocking implement, W. Hay 55,084
Weir and lock gate, hydropneumatic, W. A. Jones 552,063
Well drilling, apparatus, S. A. Horton 551,824
Wheel. See Fifth wheel.
Wire fabric machine, W. D. Whitney 552,025
Window screen, T. B. Doolittle 551,812
Wool washing machine, H. W. Church 552,083
Wrapper or envelope, F. E. Wright 551,881
Wrench. See Monkey wrench. Pipe wrench.
Wringer stand, P. Seiler 551,936

DESIGNS.

Advertising stand, G. C. Hall 25,011
Box, T. E. Wiedersheim, Jr 25,000
Box cover, M. Ernst ..... 25,001 to 25,005
Buttoner, glove, G. P. Farmer 24,997
Cash register case, J. Kirby, Jr 25,012
Churn dasher, W. Sanders 25,009
Clasp fastener, E. Colton 24,998
Dish, covered, T. Haviland 24,994, 24,995
Dish, covered, C. A. May 24,996
Heel plate, J. W. Gibbs 24,999
Holdback base, F. M. Bixby 25,008
Knit fabrics, pattern for, Pepper & Davis 25,016
Pump curb, Bennett & Daly 25,014
Rake, lawn, L. Gibbs 25,010
Stove, heating, G. W. Cope 25,007
Table, L. Von Grave 25,006
Tamping tool, G. H. Thomas 25,013
Type, font of printing, J. Schmohl 25,015

TRADE MARKS.

Antipyretic, analgesic, and anodyne, K. M. Turner 27,529
Antiseptic for external use, Fairchild Brothers & Foster 27,530
Baking powder, Cameo Baking Powder Company 27,507
Bicycle parts, Indiana Novelty Manufacturing Company 27,548
Braids, cords, metal thread, and other trimmings, Rosenfeld & Jonas 27,505
Brooms and wisps, American Broom and Brush Company 27,494
Candy, Pan Confection Company 27,514
Ceramic ware, George Borgfeldt & Company 27,495
Cigars and cigarettes, Mandelbaum Brothers 27,509
Cleaning and polishing preparation, A. Alexander 27,536
Corsets, E. Schweinburg 27,500
Cotton on spools or reels, sewing, J. Chadwick & Brother 27,503
Cough drops, C. S. Mather & Sons 27,518
Cough drops, Snyder, Chaffee & Company 27,519
Dentifrice, Sennett Enamel Cream Company 27,517
Dentifrice and chewing gum combined, J. G. Van Marter 27,516
Deodorant, L. Holtzman 27,532
Dresses, corsets, waists, and underwear, I. M. Rew 27,499
Dyes for household use, W. Brauns 27,539
Fertilizers, Michigan Carbon Works 27,542
Flour, wheat, Russel & Miller Milling Company 27,508
Food, semisolid malt, Theobram Manufacturing Company 27,512
Games, W. P. Curtis 27,492
Gin, Firm of E. J. F. Brands 27,511
Gum, chewing, J. E. Primo & Company 27,515
Hats, certain named, Higson & Collings Company 27,496
Hosiery, Cahen & Neyron 27,501
Insecticides, Roachsault Manufacturing Company 27,533
Iron and steel plates, Falcon Iron and Nail Company 27,547
Leather, kid, Firm of C. Hauselt 27,506
Medicated preparation of grain, H. H. Wampole & Company 27,513
Medicinal powders for certain named diseases, O. V. Limerick 27,528
Medicinal preparation for certain named diseases, M. J. Bacon 27,527
Medicinal use, coal tar derivatives for, R. H. Hunstock 27,531
Medicine for the cure of headache or neuralgia, Dr. Kilmer & Company 27,522
Metal polish, Burnham & Company 27,537, 27,538
Oils, lubricating, Cuypers & Stalling 7,541
Puzzles, G. C. Lynch 27,498
Remedies for catarrh, F. E. Nye 27,523
Remedies for nervous troubles and headache, Kola Medicine Company 27,521
Remedies, headache, Gilbert Brothers & Company 27,520
Remedy for rheumatism, E. C. Chamberlain 27,525
Remedy for rheumatism, J. N. Paine 27,526
Remedy for seasickness, Mal-de-Mer Company 27,524
Salve, J. J. Stoll 27,534
Shade rollers, Stewart Hartshorn Company 27,543
Skirt bangers or waist adjusters, A. Wolf 27,497
Skirts, waists, and neck wear, ladies', Dettleback & Reizenstein 27,498
Soap, S. W. Diffee 27,535
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Talcum, powdered, Allen-Foise Manufacturing Company 27,540
Thread, spooled, A. E. Boas 27,504
Tools, steel, and the like, J. Taylor 27,546
Twist, knitting silk, embroidery silk, and ribbon chenille, machine, Brainerd & Armstrong Company 27,502
Whisky, rye, Fleischmann & Company 27,510
Wringer rolls, American Wringer Company 27,544

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

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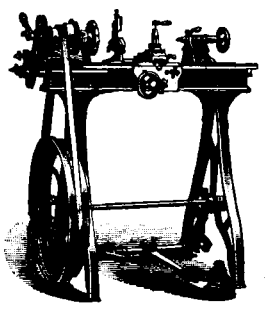

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New and original features, especially adapted for **Bicycle, Electrical,** and general light **Machine Shop Work.**

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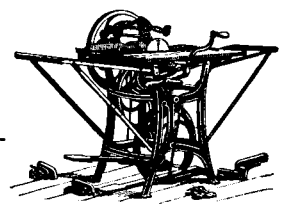

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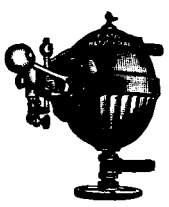

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Its general use the past 10 years is best proof of its superiority.

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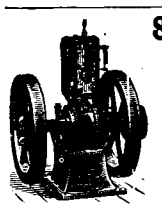

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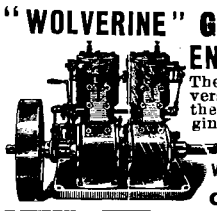

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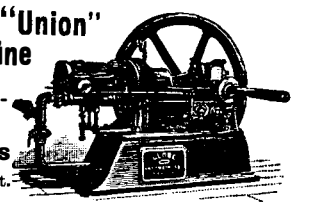

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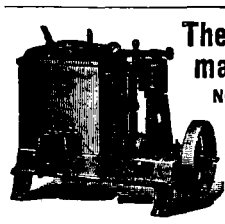

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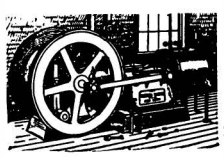

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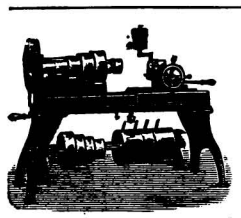

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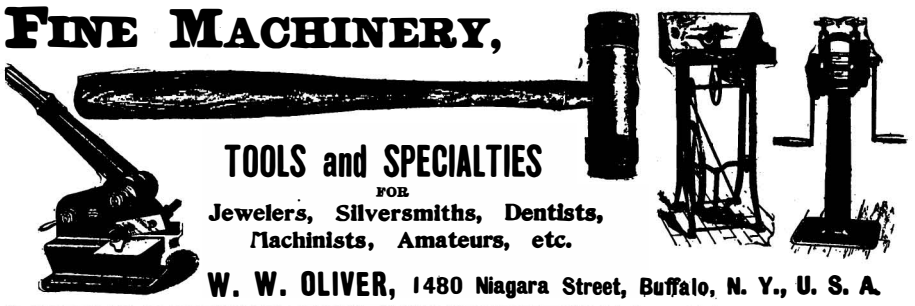

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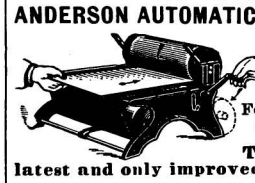

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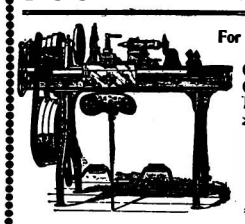

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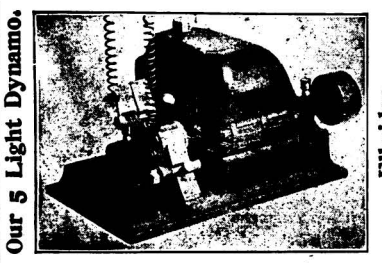

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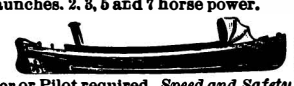

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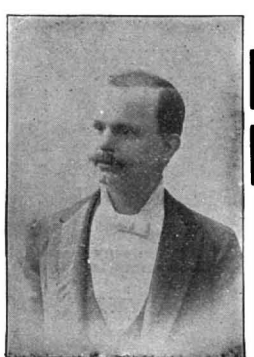

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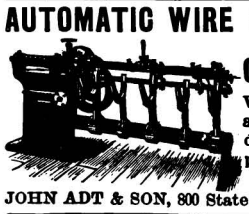

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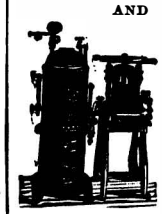

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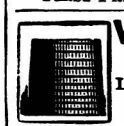

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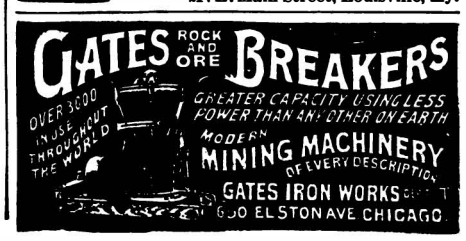
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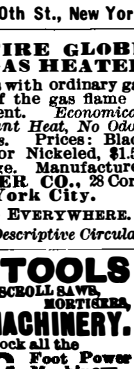

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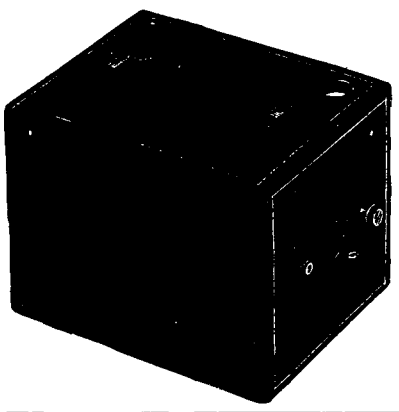

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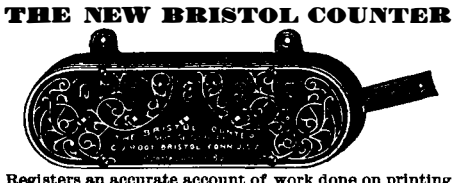

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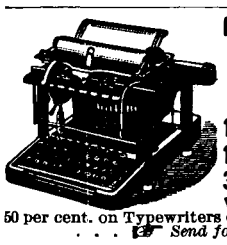

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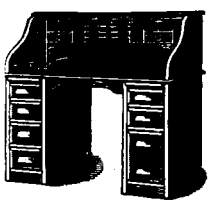

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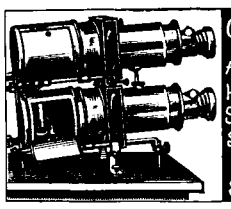

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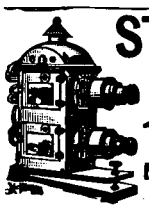

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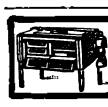

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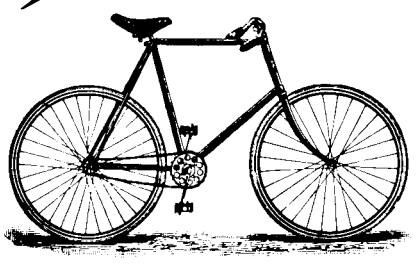

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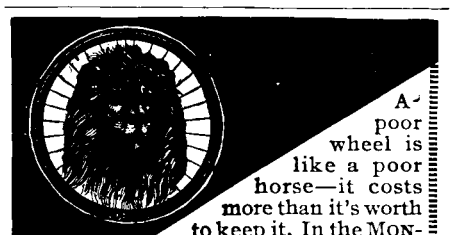

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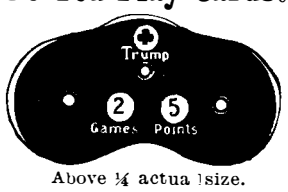

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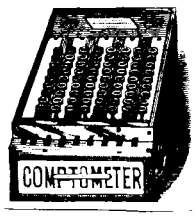

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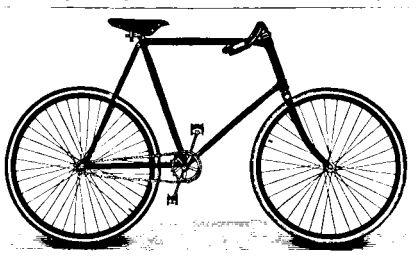

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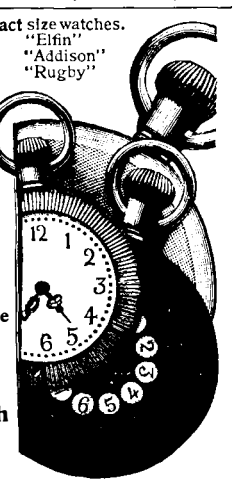

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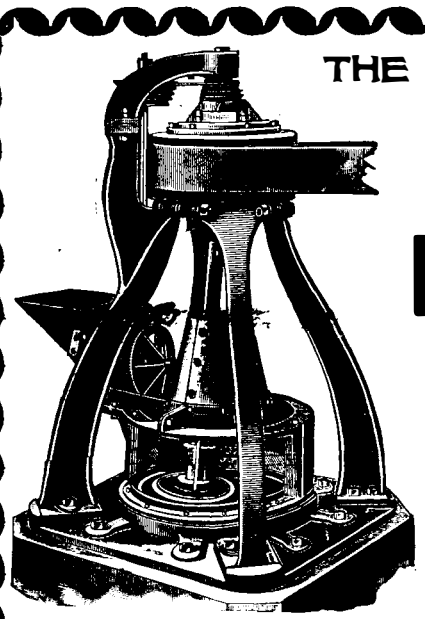

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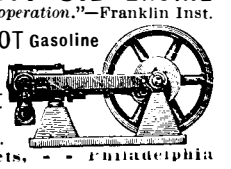

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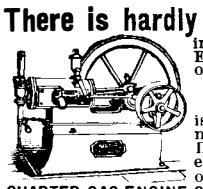

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